ELECTRICAL TIMES

THURSDAY
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Industrial Motor Works, Bradford

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BM.5

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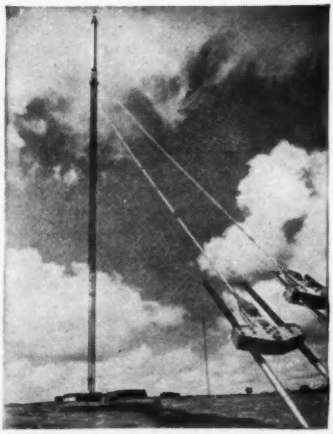

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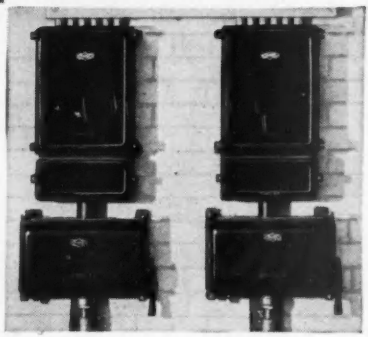

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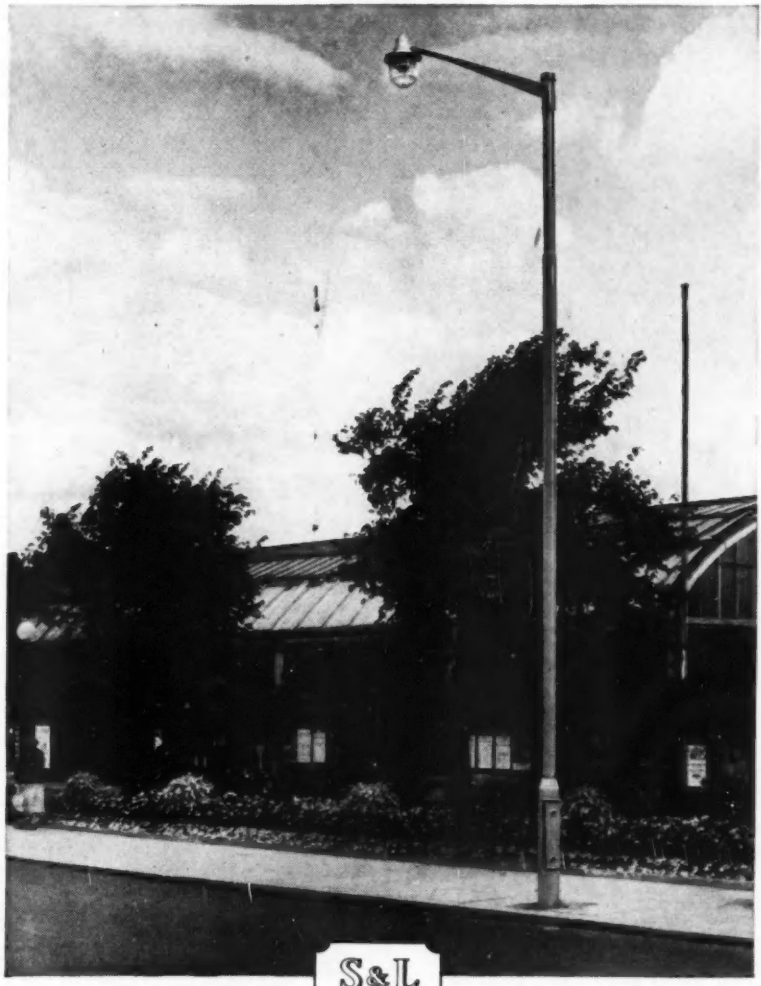

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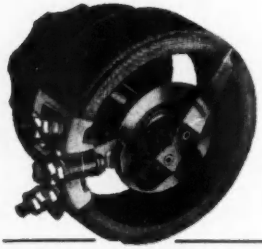

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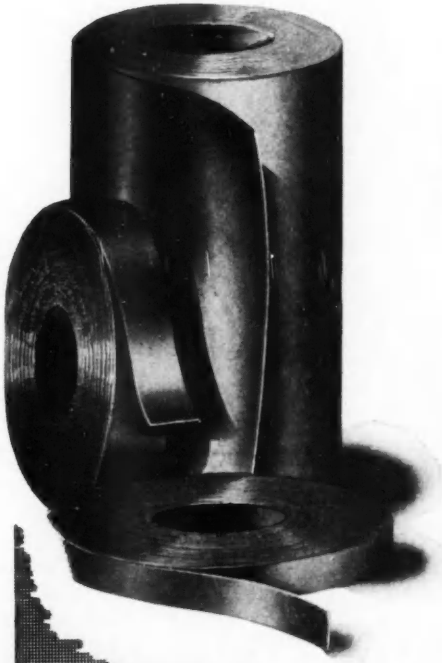

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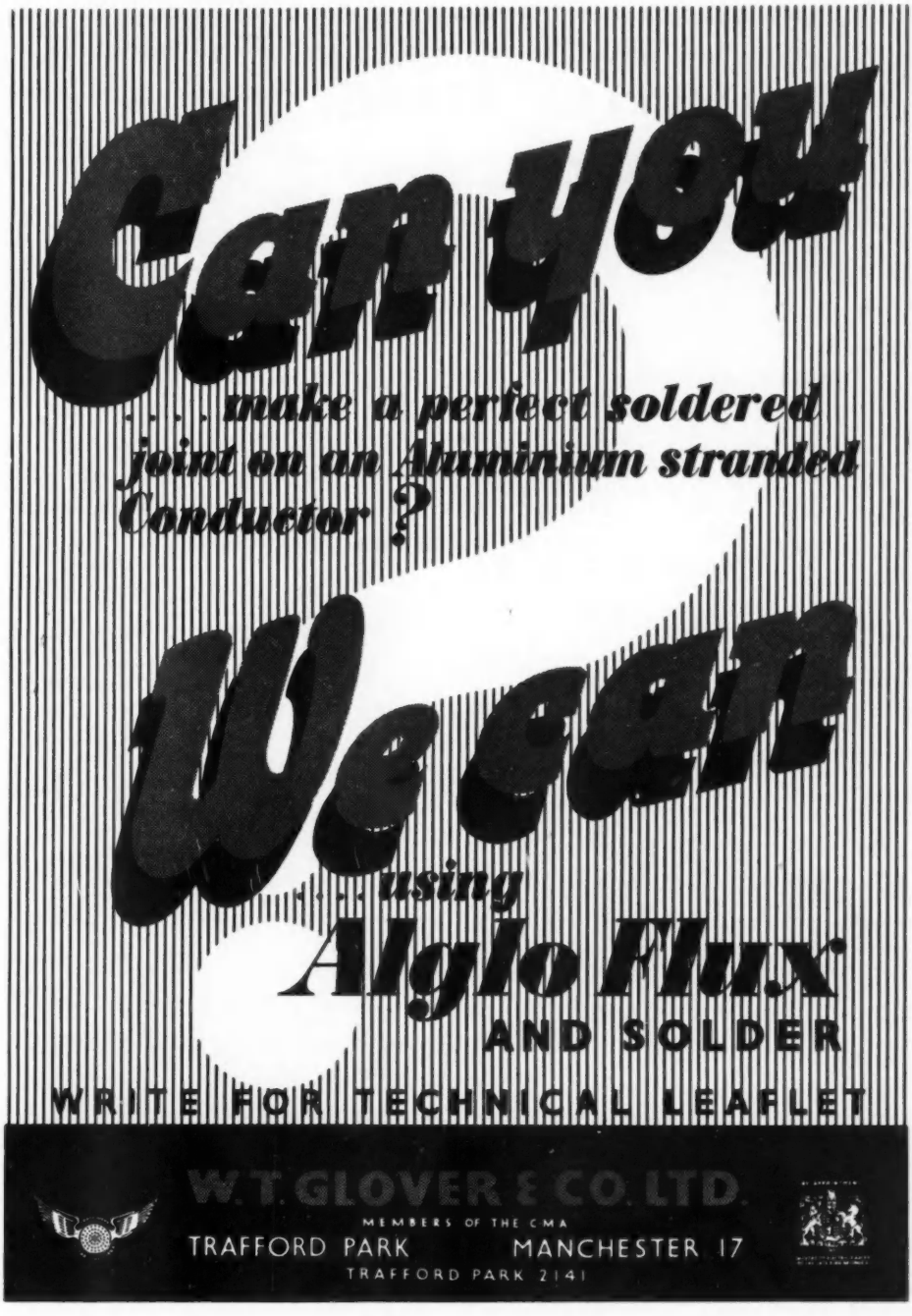
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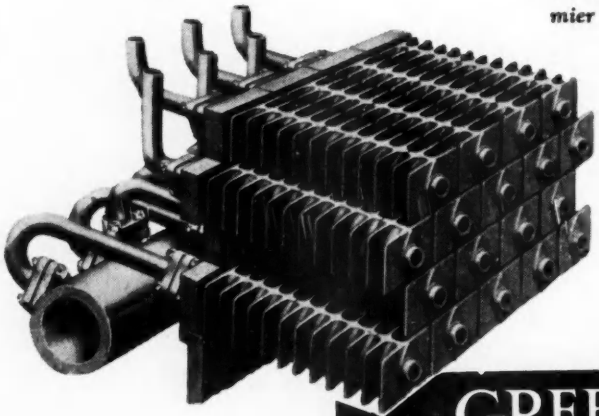

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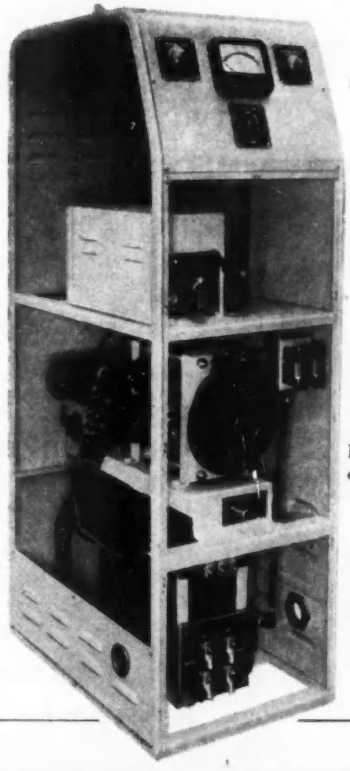

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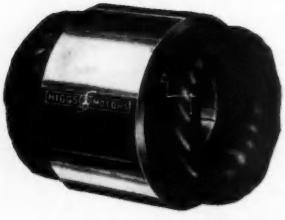

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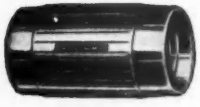

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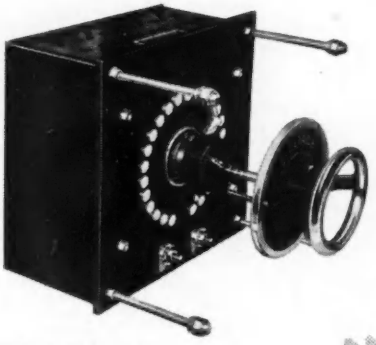

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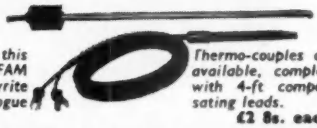

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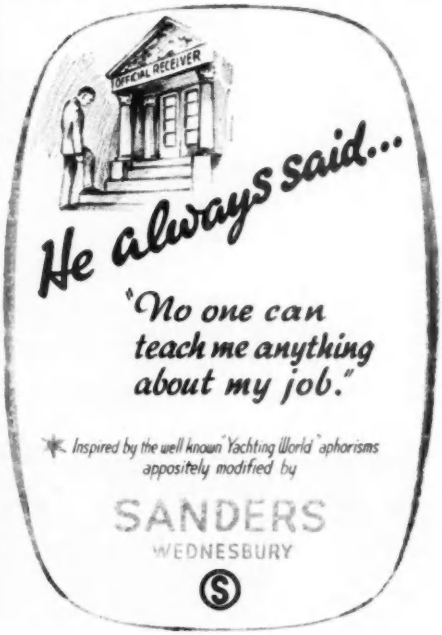
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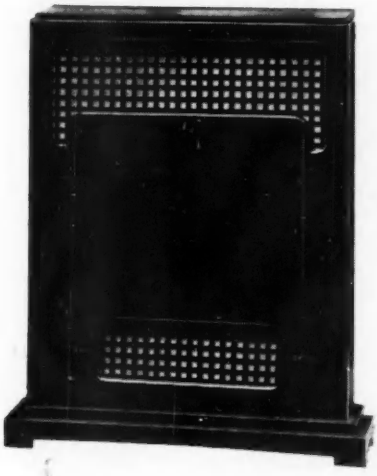

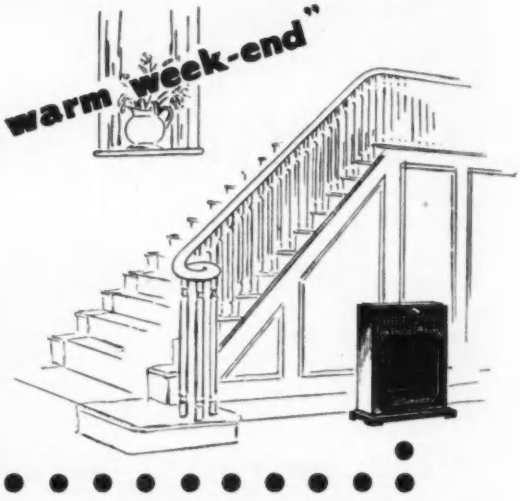

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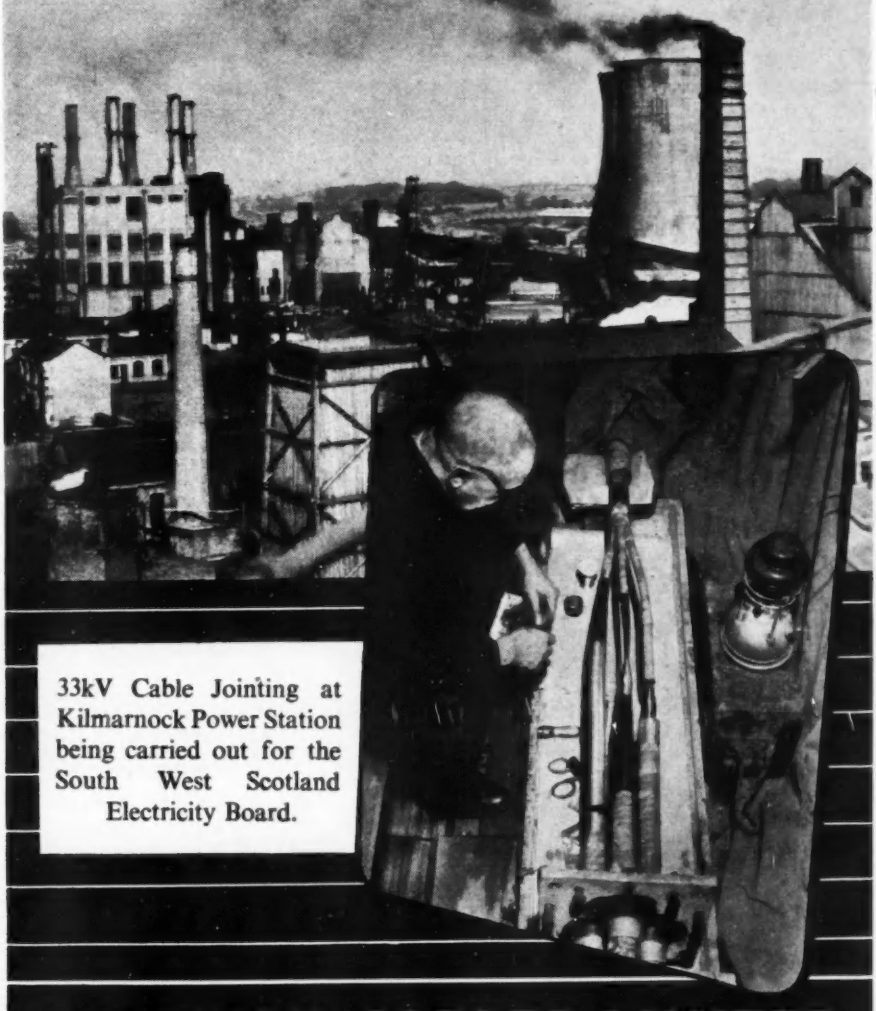

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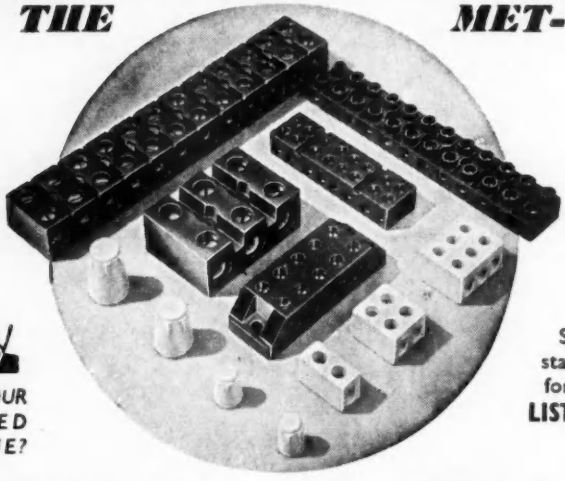

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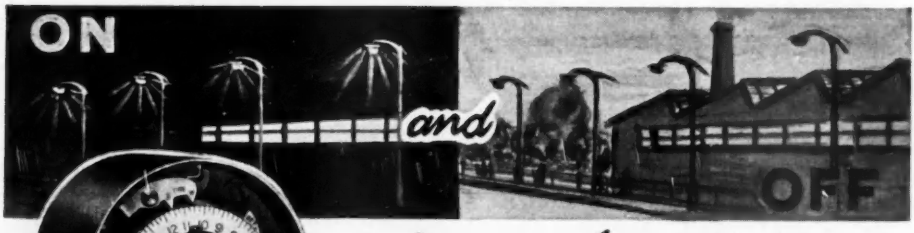

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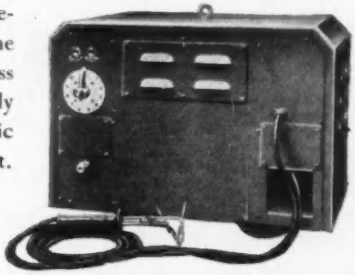

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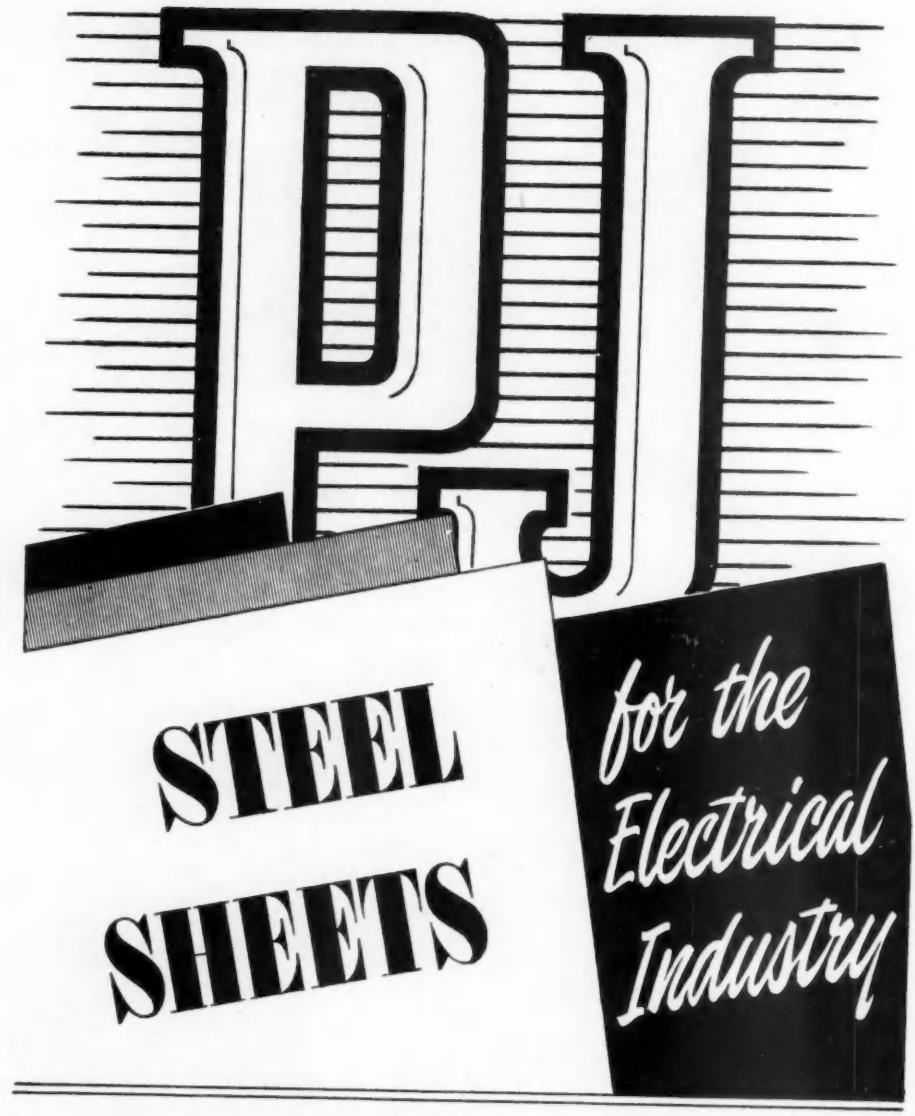

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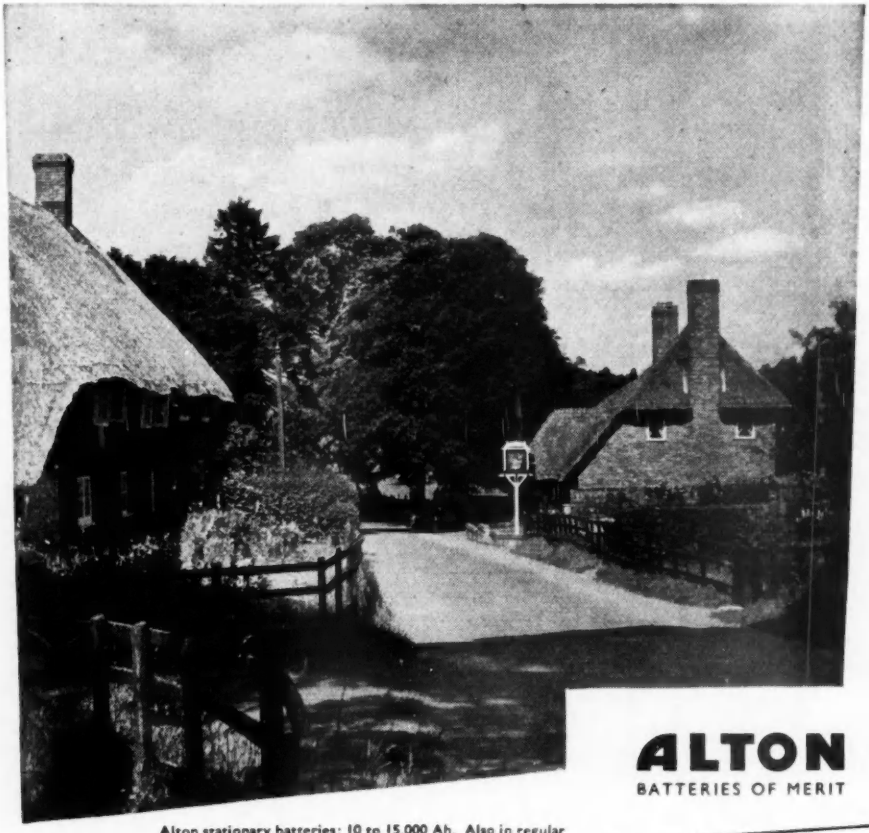

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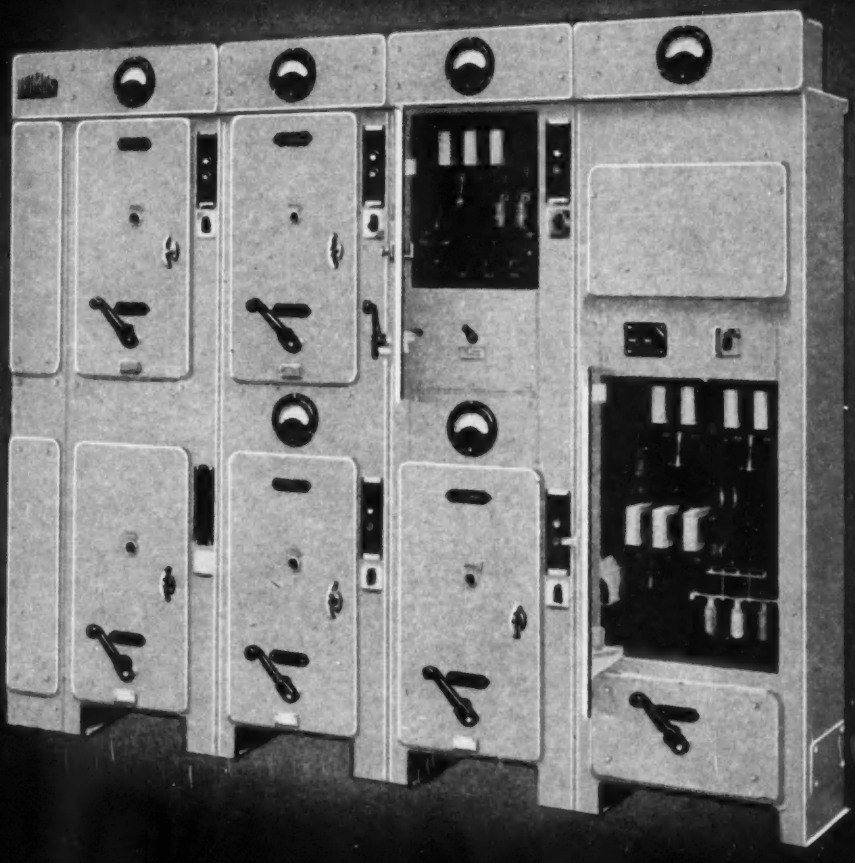

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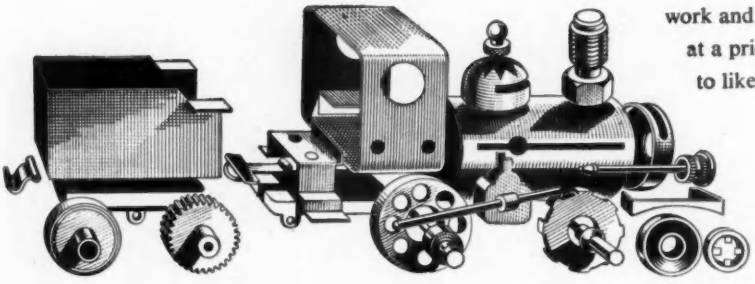
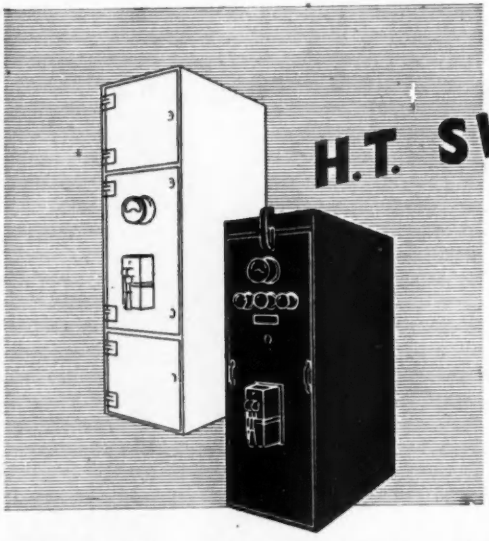


GRIFFITHS, GILBART, LLOYD & Co. Ltd.
EMPIRE WORKS, PARK ROAD, BIRMINGHAM 18
Telephone: NORthern 2132/4

GGL



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AIR - INSULATED
DRAW-OUT TRUCK AND
FIXED CUBICLE TYPE

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A.S.T.A CERTIFIED
BREAKING CAPACITIES
150 MVA at 6,600 Volts
150 MVA at 11,000 Volts
250 MVA at 6,600 Volts
250 MVA at 11,000 Volts

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THE NEW SWITCHGEAR CONSTRUCTION CO. LTD.
Associated with the Hackbridge & Hewittic Electric Co. Ltd.
SUTTON, SURREY
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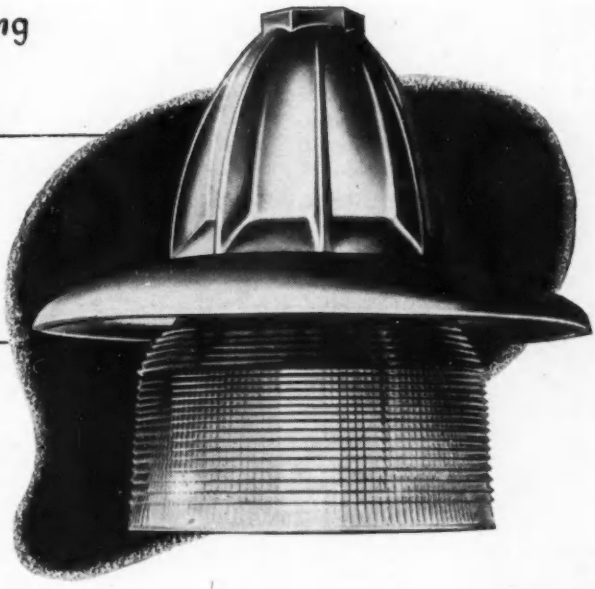
Four illuminating thoughts on street lighting



CONSISTENT QUALITY
Selective testing from production batches in the Ediswan Laboratory ensures that every Ediswan lantern conforms to the high standards of quality laid down for all Ediswan equipment.

EASE OF MAINTENANCE
Ediswan Street Lighting Lanterns have been specifically designed to reduce maintenance costs, both by reducing routine maintenance and by facilitating maintenance and relamping when required.

EASE OF ERECTION
Particular attention has been paid to ease of erection throughout the range of Ediswan lanterns.

APPEARANCE
Ediswan Street Lighting experts have collaborated with specialist Appearance Design consultants to produce a most attractive range of lanterns suitable for all types of new installations and for conversions where the existing posts are to be utilised.

The lantern illustrated is type BT20 for Group B road lighting.

Publication LE. 1572 gives details of the complete range of Ediswan Street Lighting Lanterns — may we send you a copy?

EDISWAN

Street Lighting Lanterns

THE EDISON SWAN ELECTRIC COMPANY LTD., 155 CHARING CROSS ROAD, W.C.2
Member of the A.E.I. Group of Companies
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Gears without Teeth

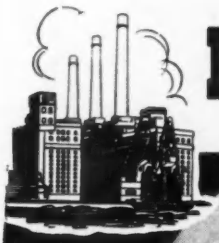
Shell research people are constantly experimenting to find even better lubricants for use in gears. For specialised wear study, four-ball and two-ball machines simulate ingeniously the combined rolling-sliding motion that occurs in gear tooth engagement.

In another machine spinning bronze discs in loaded contact give an accurate representation of wear on gears in actual service. Speed, direction of rotation and diameter of the discs can be varied to allow for the wide variety of conditions found in practice.

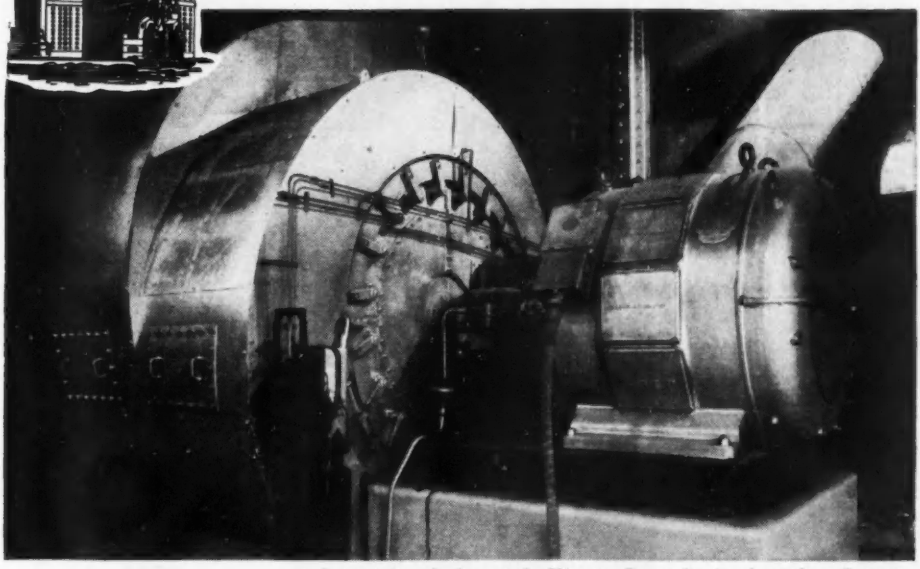
What happens to oils in high-speed gears? That problem is studied at Thornton in gear rigs which turn at up to 15,000 r.p.m.

Shell research is not a rapid process because any one result has to be tested again and again, in theory and practice, before it is allowed to stand. The Shell Lubricant in *your* gears is the result of this kind of research-in-depth.

SHELL LEADERSHIP IN LUBRICATION



L.D.C. 'Corcooled' Motors



Induced draught fans at the Kingston Power Station driven by a 2-speed squirrel cage L.D.C. "Corcooled" motor. 295/164 H.P., 735/585 r.p.m.

The design and construction of 'Lancashire Dynamo' "Corcooled" totally enclosed motors ensures that the fume or dust-laden atmosphere does not come into contact with the windings. The cooling method is efficient and an extensive range of these machines has been "Buxton Certified" as Flameproof in respect of Groups I, II and III gases.

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The Symbol of Power in Industry for over 50 years

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"ERSKINE HEAP"

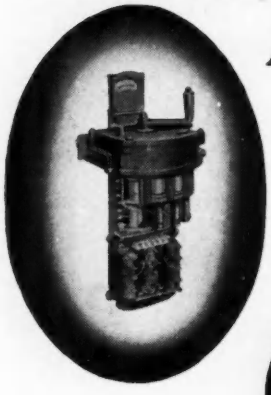
Motor Control Gear

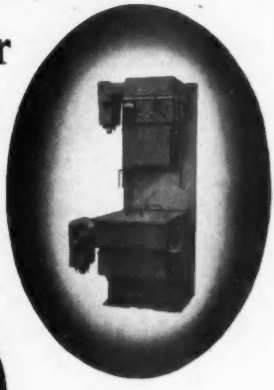
¼ H.P. up to 5,000 H.P.

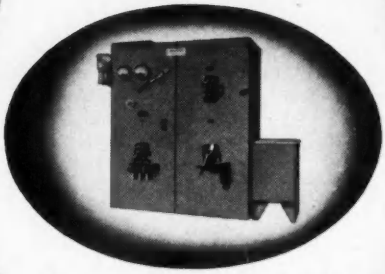
Auto Transformer Starters

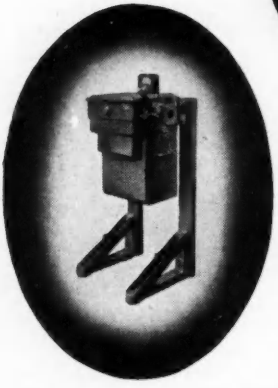
HV and LV

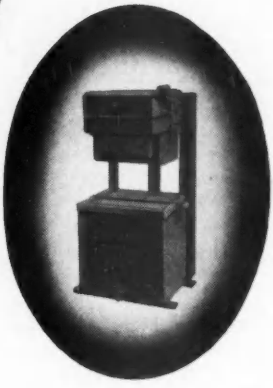
Only the minimum maintenance required











TOP LEFT: 70 Amps. Type AT.5. with tank removed.
TOP RIGHT: Auto Transformer Starter using non-automatic change-over switch.
CENTRE: 3 Oil Circuit Breaker Type Auto Transformer Starter.
BOTTOM LEFT: 50 Amps. Type AT.10.
BOTTOM RIGHT: 150/180 Amps. Type AT.15.

Standardise on "ERSKINE HEAP"

All sizes of Auto Transformer Starters can be supplied if necessary to give Korndorffer connections and eliminate the cutting out of the auto transformer in the changeover from start to run thereby ensuring completely smooth starting.

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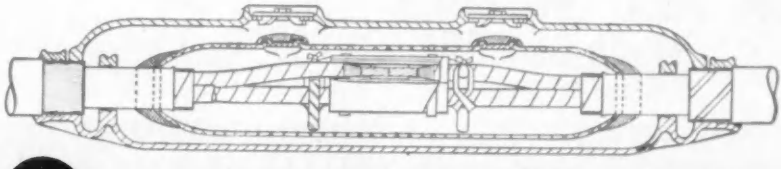
Successfully impulse tested at 250kV!

Two 11kV joints were recently made by one of our customers. Following our printed instructions, using our standard impregnated paper separators, the joints successfully withstood 250kV surge tests. Failure of the cables at 250kV and 260kV ended the tests. BICC joints for 3·3, 6·6 and 11kV work provide the highest factor of safety. The patented insulating separators are simple to apply with the minimum of skill.



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BRITISH INSULATED CALLENDER'S CABLES LIMITED
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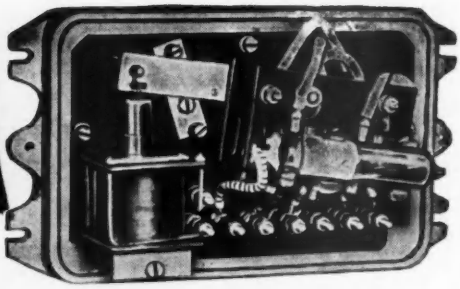

Of extremely compact design, substantially mounted and well protected, ISENTHAL Relays are available in a range of Tilting and Vertical Plunger types, and can be relied upon to give efficient and dependable performance.

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ELECTRO-MAGNETIC
RELAYS

for operating Mercury Switches up to 30 amp
Enquiries should give all available technical details as our relays are extremely adaptable, and many sub-standard forms are available for special duties.

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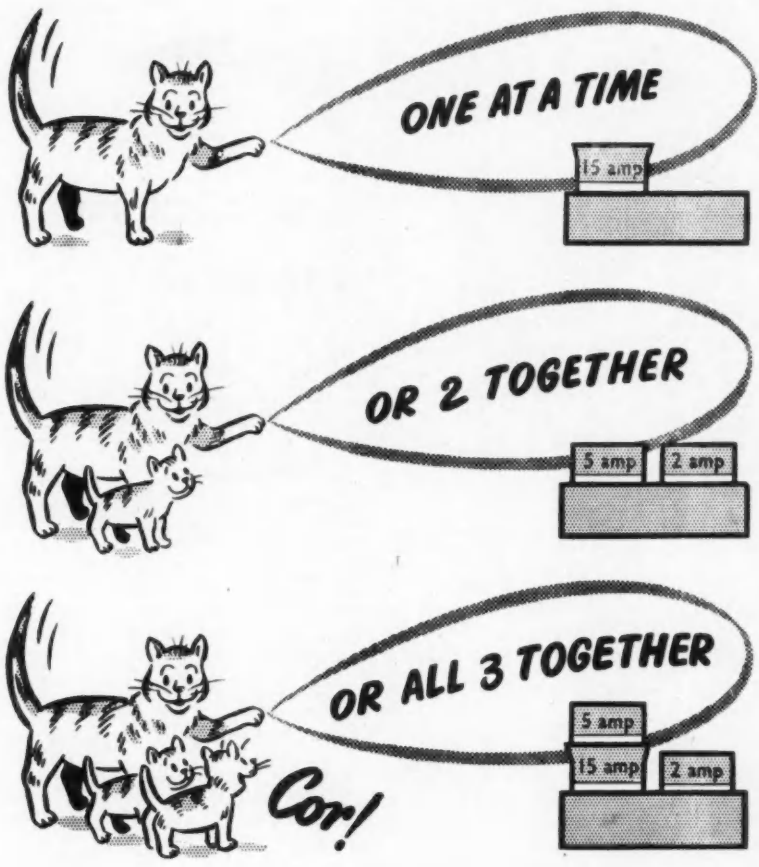

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DUAL SOCKET

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GEORGE H. SCHOLES & CO. LTD., WYLEX WORKS, WYTHENSHAWE, MANCHESTER

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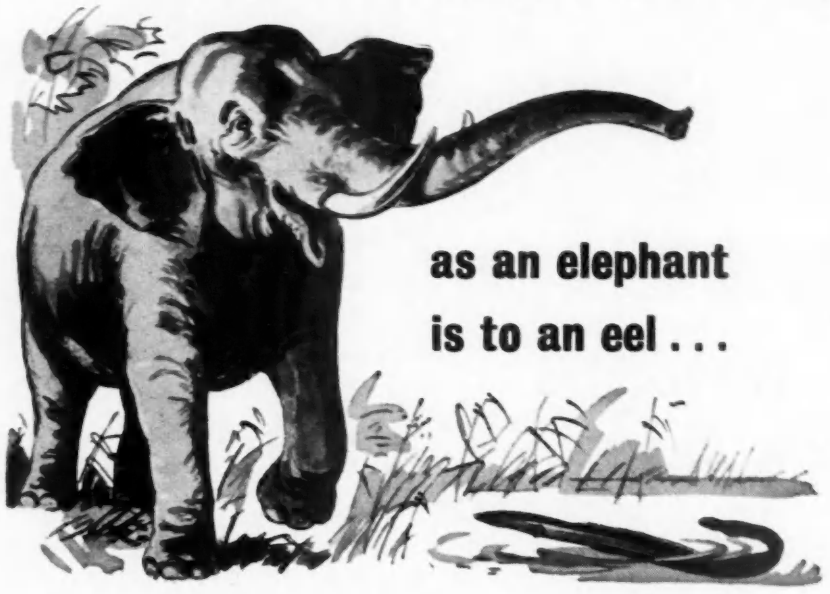

— so is a GENERAL Heavy Duty Trailing Cable to a GENERAL Plastic Insulated Cable. With little surface resemblance, both are characterised by the right degree of strength, toughness and flexibility they need for their jobs. And it's the same with every one of the many standard types of cable which GENERAL manufacture . . . all are cables of quality, durability and fitness for purpose, qualifying our claim that " General Cables today prevent trouble tomorrow ".

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Suppliers of
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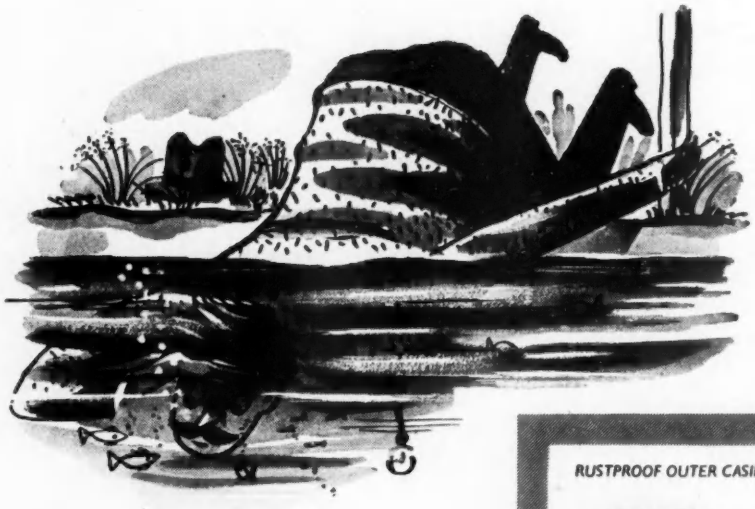
to the
DOMESTIC APPLIANCES INDUSTRY

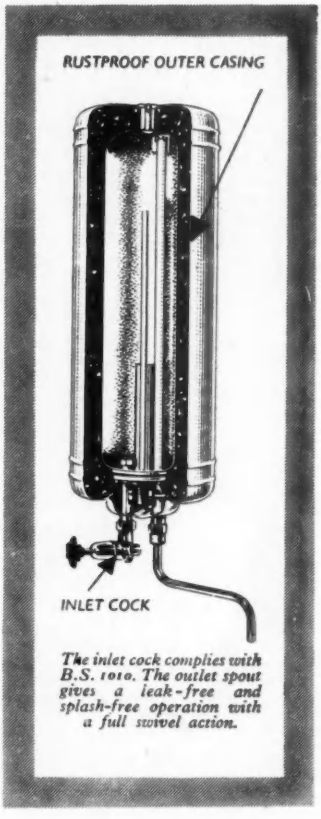
More in it than meets the eye!



The high quality steel sheet outer casing of G.E.C. electric water heaters is *treated with an anti-corrosive coating and finished with two coats of white stove enamel.* The casing has no metallic connection with the inner container other than the necessary electrical bonding.

The enamel is more durable than cellulose. It adheres tightly and will not chip. The colour is retained throughout life of the heater.

G.E.C. specialises in domestic and industrial water heating applications. Advice is given on the choice of equipment to suit individual requirements.



The inlet cock complies with B.S. 1010. The outlet spout gives a leak-free and splash-free operation with a full swivel action.

G.E.C.

ELECTRIC WATER HEATERS

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TRUE COAL ECONOMY.

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NO WORRIES ABOUT SELF-SUPPORTING COILS

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This newest Burco model is advertised in a host of front rank magazines appealing to women, reaching millions of readers, all of whom will be interested in labour saving appliances. Be ready for enquiries —stock Burco . . . .

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OF ALL-ELECTRIC WASHING MACHINES

Also makers of the famous Burco Electric Washboilers.

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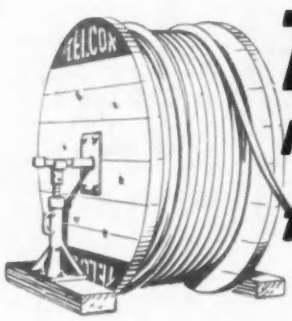

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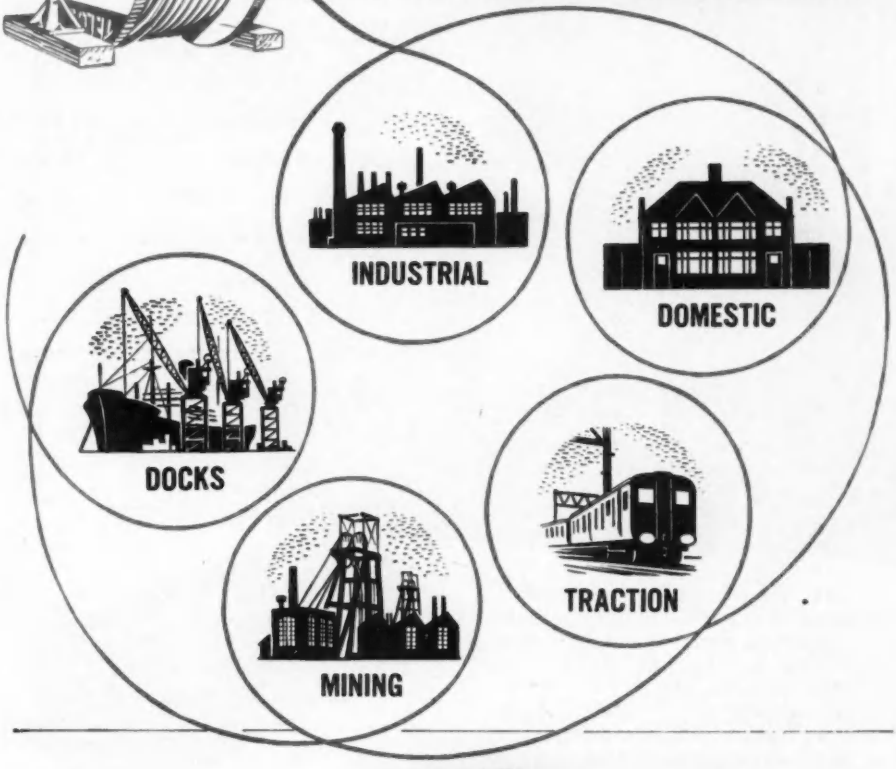

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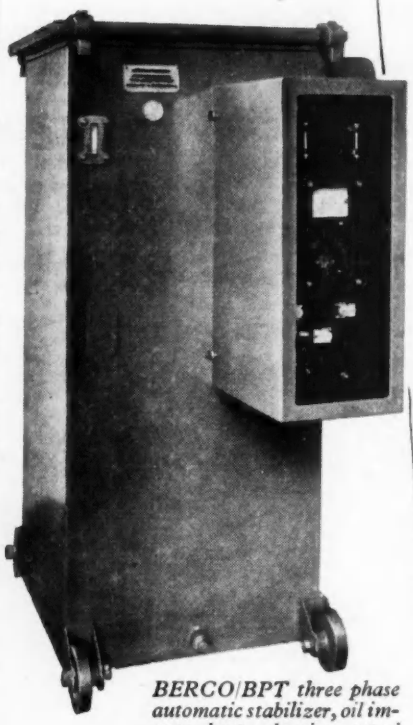
Enquiries to: **TELCON WORKS, GREENWICH, S.E.10.** *Telephone*: *GREenwich 3291*



BERCO/BPT three phase automatic stabilizer, oil immersed type, showing control gear compartment.

Don't let VF* *cost you money*

With the bugbear of " V.F."* (Voltage Fluctuation) efficiency of plant and apparatus suffers and output is interfered with which eventually means *financial* loss. BERCO and BPT voltage control equipment is successfully controlling the voltage in organisations all over the world providing a constant voltage where ± fluctuation is eliminated.

For constant voltage use a model from the wide range of Automatic Stabilizers made by British Power Transformer Co. Ltd., for single and three phase supplies.
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Interesting information and full performance details given in booklet No. C1051.

BERCO hand-operated single-phase Regavolt

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Give full Protection

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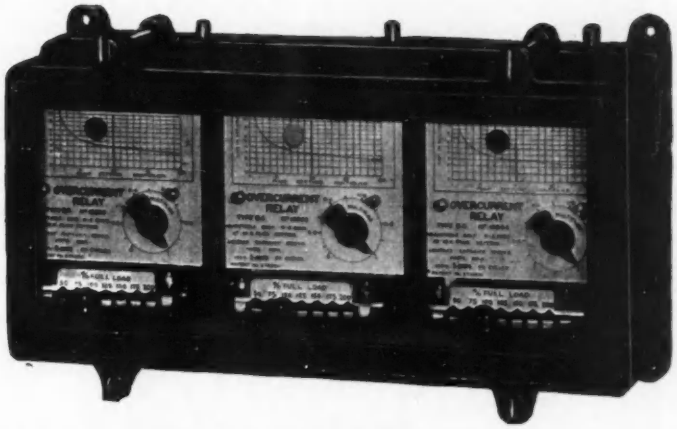

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N.C.S. PRODUCTS include Indicating and Recording instruments of all types including Synchronisers, Vectormeters, Frequency Meters, etc.

NALDERS RELAYS give full protection to Generators, Transformers, Transmission Line Busbars, Feeders, Meters, etc. They have high torque, low energy consumption, and a wide range of adjustable settings. The Relays are vibration and surge proof, fitted with reliable contacts and operation indicators. The panel space occupied is small Various types are available in single, double and triple pole patterns for horizontal or vertical mounting.

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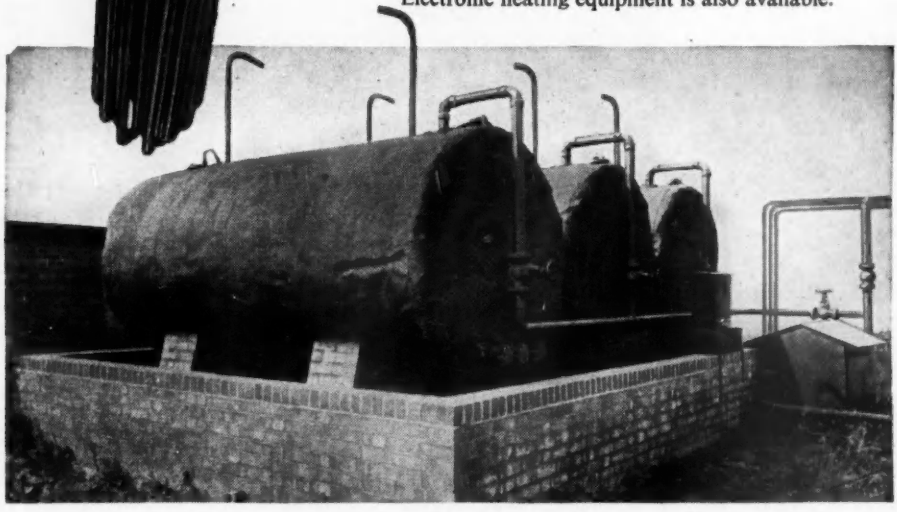
for Water, Oil, and Alkaline Solutions

Electric immersion heaters are only one of many forms of industrial " Pyrobar " heating equipments developed and perfected by BTH. They provide an exceptionally safe, ready, and economical means of heating water, oil, or alkaline solutions for industrial and scientific purposes. An automatic temperature regulating device can be used so that little attention need be paid to the heater over long periods. (1) Shows an immersion heater suitable for A.C. or D.C. supply up to 500 volts. (2) Three oil-storage tanks used for gas-turbine test house each fitted with three 6 kW immersion heaters.

Standard sizes range from 1 kW to 36 kW for water, 1 kW to 3 kW for oil; & 1 kW to 4 kW for alkaline solutions.

Special sizes can be built to order.

Other types of industrial heating equipments manufactured by BTH include : cartridge, " cast-in," radiant, soft-metal, and salt-bath heaters.
Electronic heating equipment is also available.



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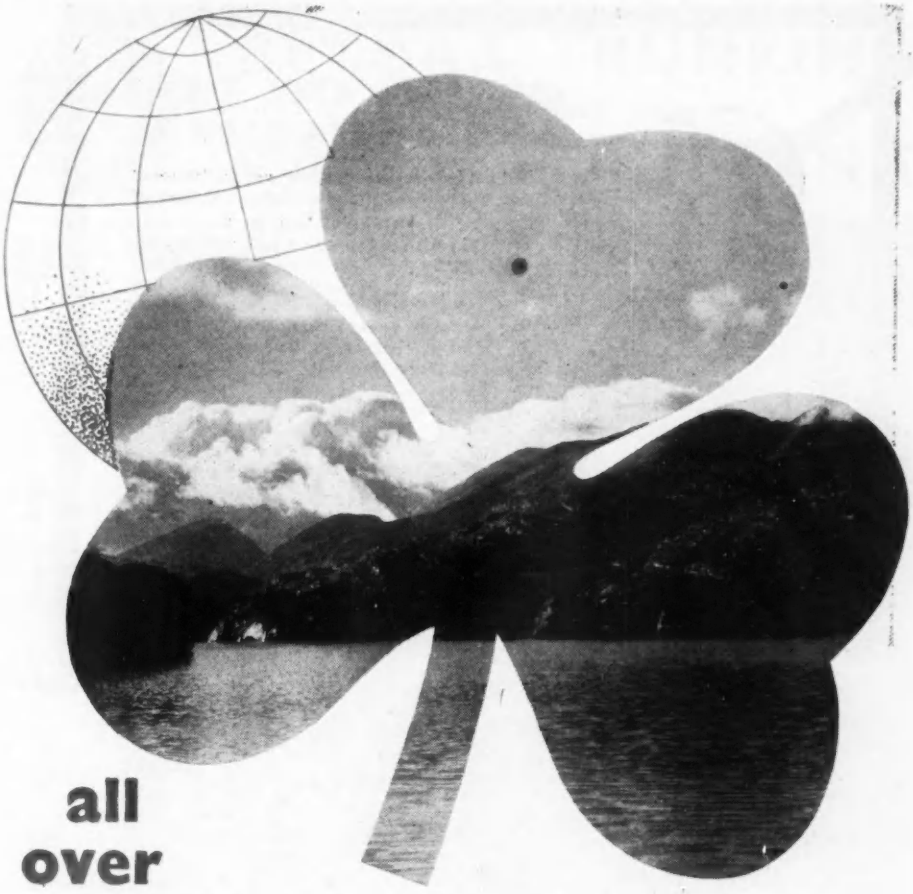

Photo courtesy Irish Tourist Association

all over the world

engineers who *know* rely on

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Whilst it is important to encourage the use of electricity it is equally important to save it!

Because they entirely eliminate waste heat, Pyramid Aluminium utensils, specially constructed for hotplate cooking, save electricity. They are much more than just flat-bottomed: the sides and base are accurately proportioned *to make distortion impossible.* Without this proviso, a flat base is no more effective than a flat lid!

Ordinary uneven pan base causes loss of heat by poor contact.

Pyramid construction gives "all over" contact. Arrows indicate heat capacity.

PYRAMID

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Let us help you to select the suitable castor for your individual requirements from our range of over 200 types!

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run mills more easily

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TRADING ESTATE · SLOUGH · BUCKS

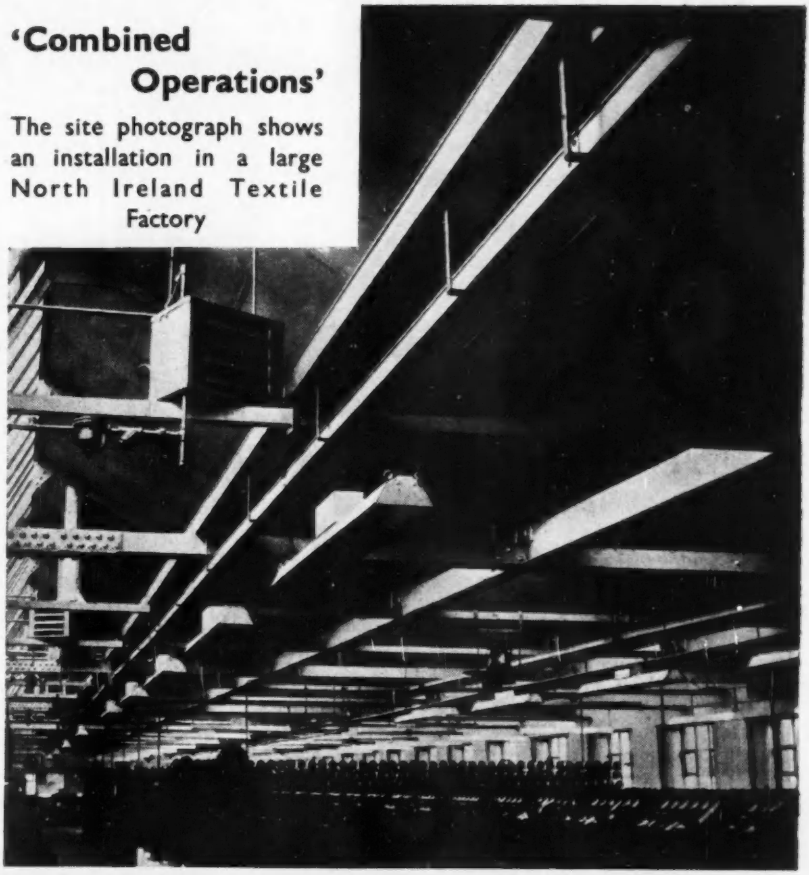
The Largest Castor Manufacturers in Europe

BUSBAR TRUNKING AND CABLE TRUNKING

IN INDUSTRY

'Combined Operations'

The site photograph shows an installation in a large North Ireland Textile Factory



London Office: Wellington House, 125/130 Strand, W.C.2
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is now being

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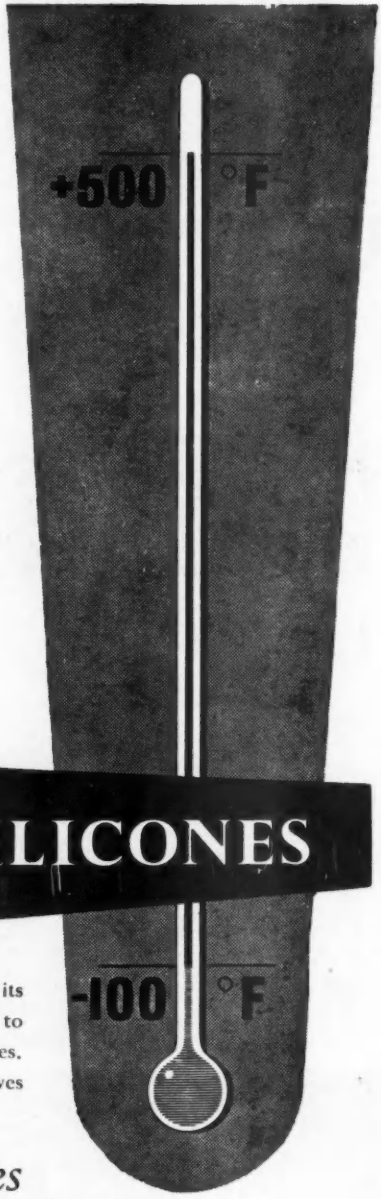

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SILASTOMER is a silicone rubber which retains its flexibility over a temperature range of — 100°F to + 500°F. It has excellent dielectric properties. The use of Silastomer components solves many engineering problems.

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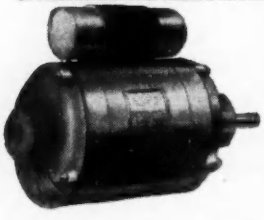

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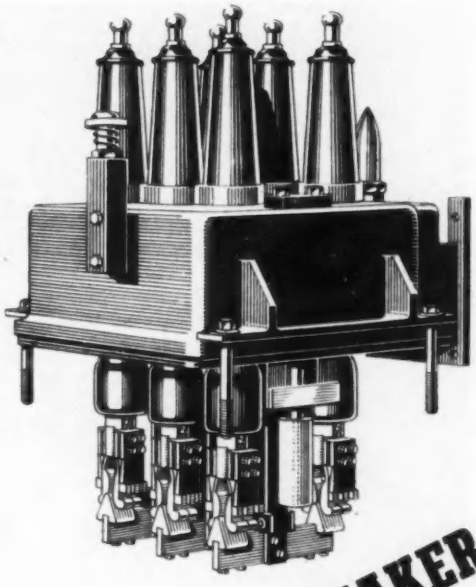

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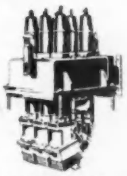

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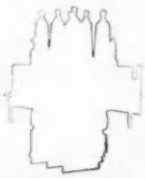

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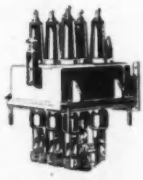

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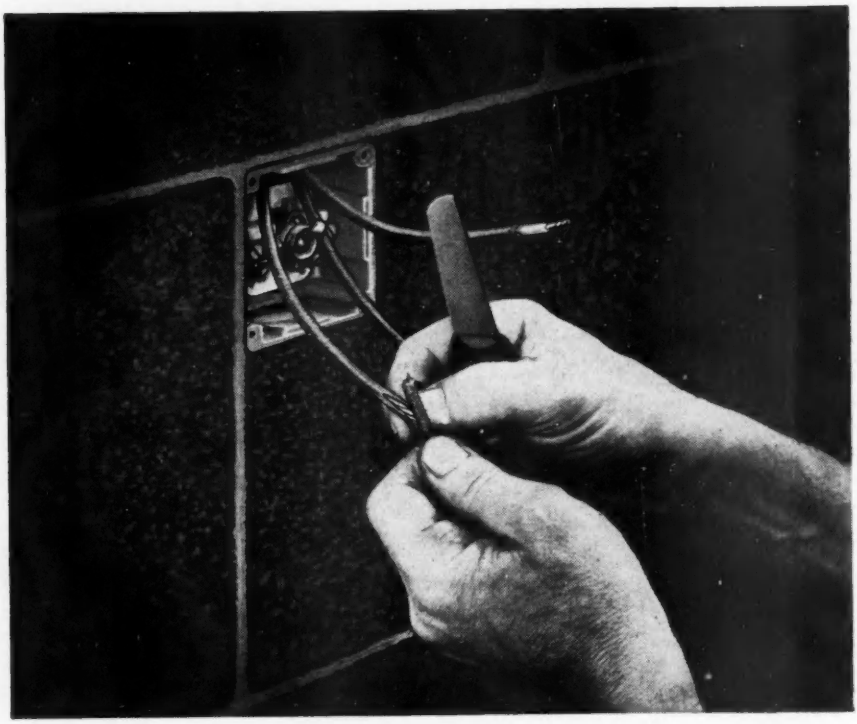

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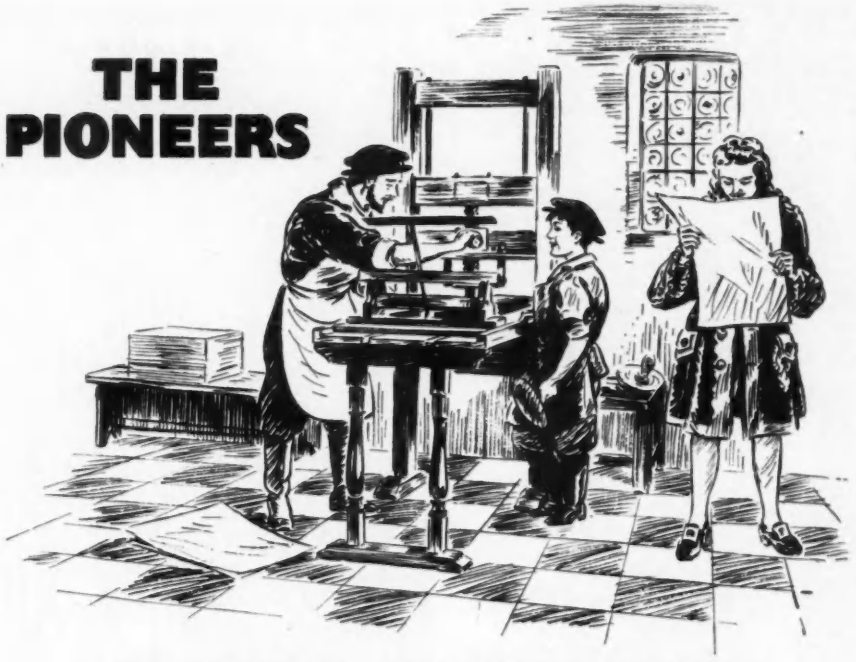

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(Main illustration). Boiler during erection showing the walls of the superheater chamber (Inset illustration). Lifting the 65 ton fusion-welded steam drum for one of the Stirling boilers at Keadby.

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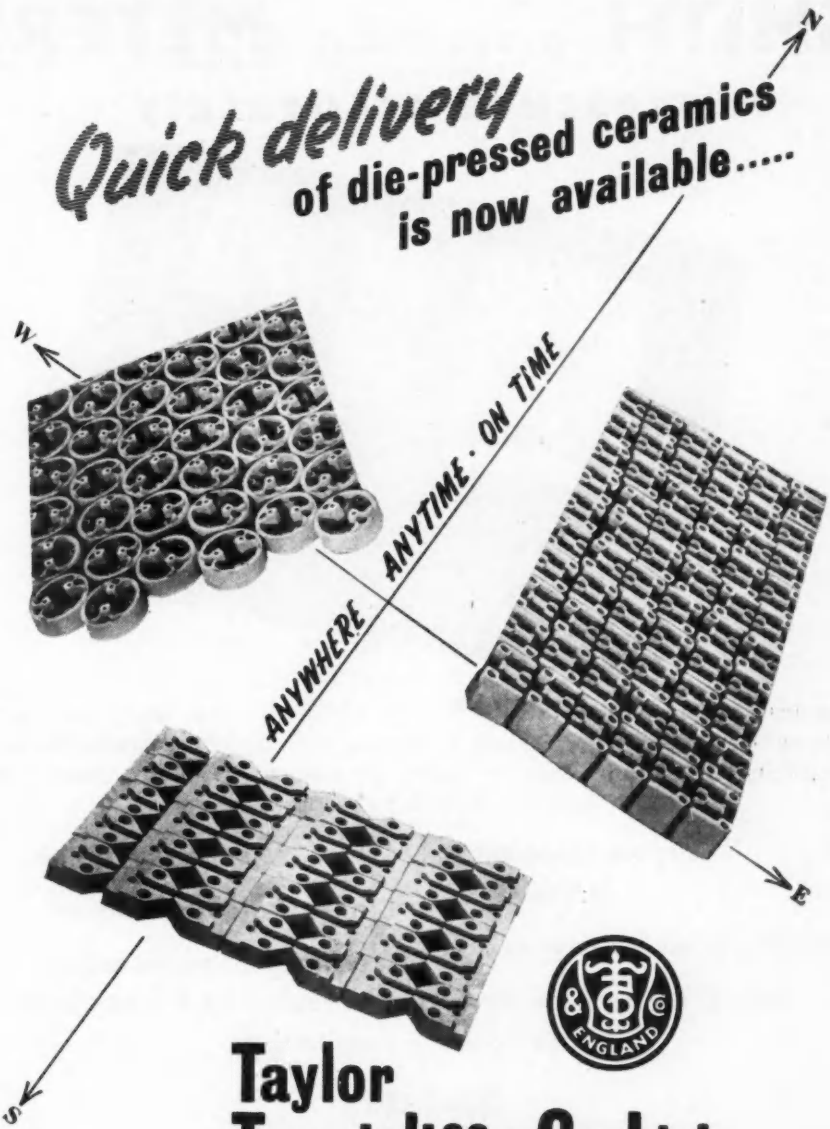

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ELECTRICAL TIMES

Volume 122 No. 3185 20 NOVEMBER, 1952

PUBLISHED EVERY THURSDAY

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Editorial

ECLIPSE IN COOKERS

IMMEDIATELY after the war the prospects for electric cooking looked particularly bright. Pre-war experience had more than shown the way, personal surveys confirmed the domestic preference for electric cooking and with a vast housing programme on hand, the future looked assured. Then came the slump. The most conservative estimates of cooker sales proved over-optimistic and manufacture had to be geared down. Not only did housing fail to reach its target but far more vital, electricity has commenced to lose its hold in this held. The basic virtues of electric cooking fiave been discounted in the public mind and if evidence of this is required, it is to be found in the latest report of the Gas Council. Out of 53,000 new houses erected during the year, no less than 80% of the occupiers chose gas for cooking. Unquestionably the Gas Council have put forward the more favourable examples to proclaim their case, but as this quoted example amounts to well over one quarter of the total new houses built, the inference is only too clear.

GOING GOING—?

WHY have electric cookers failed to make the progress that they deserve? The higher price relative to gas is no new feature; this differential existed before the war when the demand for cookers was rising. The adverse publicity on load cuts may have over-influenced the public, but surely this alone cannot be responsible for the change in public sentiment. What has been lacking is the hard slogging commercial drive of the pre-war days. Such a drive has been difficult for area boards to emulate; the shortage of plant seems to have entered into the soul of some of them, and over all lies the restrictive hand of the ministerial embargo on promotional activities. Within this limitation, however, it is difficult not to feel that more could have been done. A similar embargo has been placed on the Gas Council, yet this did not halt the recent widely publicised display with gas cooking at the Festival Hall nor the several broadcasts associated with it. What if the embargo were lifted—there is at least some talk of it—would the supply industry be ready to take full advantage of the new freedom, ready with the necessary programme of publicity? On their present showing they would be left at the starting post.

FREEDOM FROM QUESTIONS

FEAR of a question in the House of Commons is a potent force in producing some of the worst characteristics of our Civil Service—especially of the "go careful, avoid responsibility" type. This has been constantly in the mind of those concerned with organisation and development of the nationalised industries, which were envisaged from the beginning as quasi-independent, commercial undertakings. A successful campaign has been waged both in the course of drafting the nationalisation Acts, and by skilful use of the technicalities of Parliamentary procedure, to prevent M.P.s questioning ministers on the day-to-day working of the corporations. They can query the number of telephone boxes that the G.P.O. has allocated to a town but not the refusal of an area board to connect a farm. Yet no one has been fully content with the resulting situation. Some questions have been excluded on a seemingly arbitrary basis, and there has been little evident control over national property worth many million pounds. A Select Committee of the House of Commons, after studying the problem, has unanimously approved the essentials of the present arrangements as regards questions.

Such unanimity, however, would probably not have been obtained if it had been within the Committee's terms of reference to recommend legislation modifying the independence of the corporations. In the absence of this possibility, the suggestion put forward is for additional machinery to be set up for consideration of the annual reports and accounts of the boards. A further report on this theme is to be expected, though not for some months.

TRAFFIC RESUMED

A SEVERE blow was struck at many of this country's exporters of consumer goods by Australia's imposition of extensive import restrictions from last March. Electrical manufacturers were amongst those most seriously affected, and the overall value of exports of electrical goods and apparatus to the Dominions has fallen to half that before the ban. In some instances the drop has been spectacular—cookers, for example, from £210,000 every month to £12,000. This is a measure of the welcome which is assured for the announcement by the responsible minister, that from next January some relaxation will be introduced into the system of restrictions. The immediate effects of the change may be small, for the import quota allocation is to remain with levels unaltered; but goods in passage when the restrictions were imposed will no longer be reckoned against cumulative quota totals. In some cases such supplies had filled the quarterly quotas for years ahead, and in these instances some immediate benefit should be felt. Probably the most important aspect of the announcement from the long-term view, however, is the assurance it gives that Australian finance officials are watching their country's balance of payments position with the sustained intention of freeing trade as rapidly as possible.

POWER FROM HOT WATER

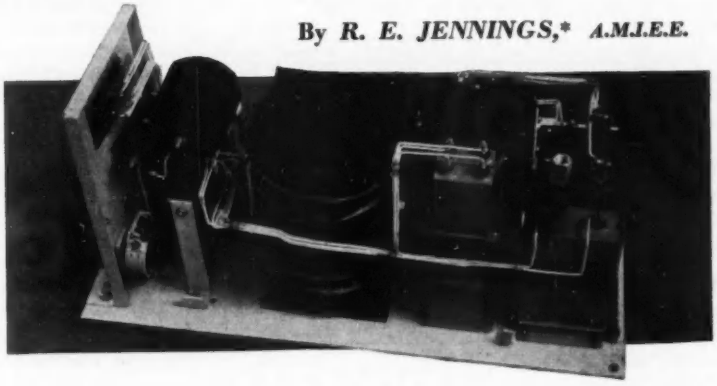
IN this modern era of electricity generating plant, when the efforts of engineers and scientists are directed towards the utilisation of ever higher steam temperatures and pressures, it comes as a relief to hear of a turbo-alternator operating on the remarkable steam input conditions of 4 lb/sq in. absolute at 158° F. Admittedly the reasons for building this unusual set are peculiar, and the circumstances under which it is operating are particularly favourable. The site in the Belgian Congo is endowed with a good supply of natural hot water in close juxtaposition to a cold water reservoir. Under these conditions the utilisation of low-grade geothermic heat becomes a practicable proposition. As the set, however, is using a conventional steam cycle, the overall thermal efficiency must be low; but this is of little importance when there is a practically inexhaustible heat supply which is well capable of supplying the electrical output required. The success of this little machine with its 240 kW output promises well for the future French scheme at Abijan, designed to operate on the ocean temperature gradient, which provides even lower temperatures and pressures.

SHOP SALES IMPROVE

SEPTEMBER figures for retail sales of radio and electrical goods show a welcome rise to well above the level recorded for this month in the last two years. On a basis of the 1950 average, the value of such sales is 120% compared with 103% last year. This is a continuation of a trend which has been apparent throughout the third quarter, and which augurs well for the approaching Christmas buying season. Nor can the improvement be attributed solely to the continued attraction of television sets and other radio apparatus. There was an increase in the sales of TV sets, but this was in some degree offset by a fall in the number of radio sets purchased. It would appear that electrical domestic appliances generally are benefiting from an improvement in consumer demand which is affecting most types of "non-food" retailed merchandise. How soon manufacturers will begin to gain in terms of increased orders is uncertain, but the outlook here seems somewhat brighter than it was a few months back.

Meteor

By *R. E. JENNINGS,** *A.M.I.E.E.*



Automatic Voltage Control

An Electromagnetic Voltage Sensitive Automatic Motor Control Unit

WITH the present-day demand for electricity greater than it has ever been before and the consequent overloading of supply systems, the consumer's voltage level is subject to both long- and short-term fluctuations. Steps are frequently taken by supply authorities to correct this state of affairs by the use of automatic or hand-controlled regulating transformers in the distribution networks, but this is not always the complete answer to the problem as local variations in load cannot be dealt with by these means. It is also a fact that the same means are used to reduce the mains voltage in times of stress to even lower levels, but this is exceptional. Together with this increasing demand there is, however, a greater dependence on the stability of the mains supply as is experienced with such applications as chemical processing, furnace control, photometry, electrical testing, meter testing stations, unattended sub-stations, etc. These generally require a constancy of supply $\pm 1\%$ but it is now becoming quite common for $\pm 0{\cdot}5\%$ to be required. Furthermore, this constancy must be maintained irrespective of the supply frequency variations which under the above mentioned conditions may range from 48 to 52 cycles/sec.

In this article it is intended to enumerate the more popular types of voltage regulators and control units, and to describe in detail a recently developed control unit for use with electro-mechanical type regulators.

This problem has been tackled by numerous people before the present conditions became apparent and fortunately several types of automatic voltage regulators have been made available. Broadly, they can be classified under two headings: (a) completely static apparatus, and (b) electro-mechanical, and they cover load requirements from small built-in stabilisers of 5 VA to power transformers of several hundred kVA.

Static-type Regulators.—In the first group the following forms of equipment can be listed: (1) saturated core type constant voltage transformers; (2) electronic voltage stabilisers; (3) saturable core reactor circuits. These have their own peculiar features but are generally characterised by a high speed of response when compared with the electro-mechanical type regulators, and are usually only suitable and economical for supplying comparatively small loads up to about 5 kVA.

Electro-mechanical type Regulators.—It is above the 5 kVA load limit that the electro-mechanical type regulator begins to show advantages. There are many types of regulators and control circuits available in various combinations, a few of which are briefly described below.

First is the moving-coil regulator, already very well known and consisting of an elongated core on which primary and secondary windings are situated, and along which a short-circuited moving coil travels. Movement of the coil up and down the core causes the output voltage to vary over specified limits, by varying the coupling between primary and secondary coils. This regulator has a somewhat higher internal impedance than the tapped transformer regulator and also causes distortion in the output

* *Research Engineer of Foster Transformers Ltd.*

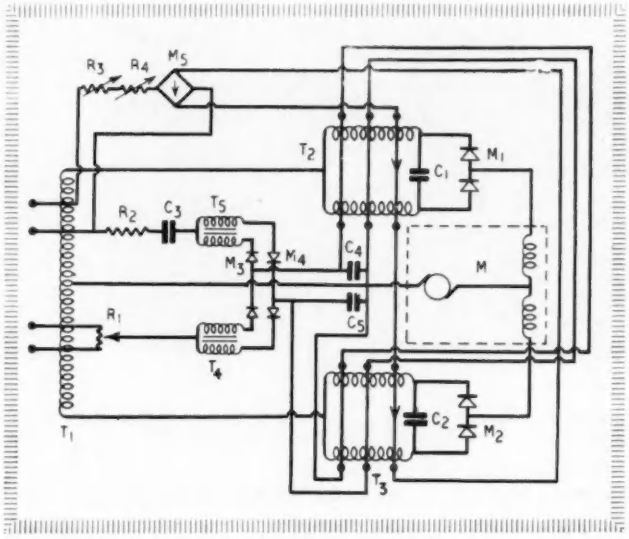


Fig. 1.—Electromagnetic control unit circuit diagram

waveform with certain types of load. Further, the dimensions of these regulators are in excess of the tapped transformer.

Second is the bared-winding transformer regulator, which consists of a single layer winding, part of the surface of which is stripped bare of insulation and mounted on either a toroidal core, or on both limbs of a straight core. A carbon brush traverses the bared winding forming an adjustable tapping point. This gives a variable ratio, usually auto-connected, transformer. This regulator is characterised by a larger core than in a standard transformer so as to provide the maximum surface for the single layer winding.

Third we have the tapped transformer regulator which approaches more nearly the ideal regulator since it is designed on standard transformer principles and has the same high efficiency and reliability. It consists of a transformer with multiple tappings connected to a selector switch which may take the form of a disc-type commutator or a special switch incorporating both coarse and fine tapping switches mechanically coupled by gearing. These switches provide a convenient form of changing the transformer ratio using only a very small motor drive. For a 3-phase switch capable of controlling 150 kVA of load a motor of 1/20 h.p. only is required.

Further information on this type of regulator known as Type VR/CF can be found elsewhere, but briefly the characteristics are: (1) low internal impedance; (2) high efficiency; (3) no distortion of output waveform; (4) smooth control of output voltage.

Step regulators are ignored in this article because the type of control unit about to be described is more particularly applicable to the smooth or infinitely variable type of regulator as described above. This does not mean however, that the control unit is not suitable for use with step regulators.

Voltage Sensitive Control Units

Dealing now more particularly with the subject of this article and its predecessors in this field, these come under three broad headings, namely, (a) Contact making voltage sensitive relays, (b) Electronic control circuits, and (c) Electromagnetic Control units.

Voltage Sensitive Relays.—Under the first heading can be grouped the various forms of contact making voltmeter, marginal relay, astatic relay, and other forms of solenoid operated contacts. Various refinements have been made in the design of such relays to ensure positive operation of the contacts, prevention of overshoot and damping to prevent undue wear, but most relays require auxiliary contactors to energise the operating motor and all have a normal sensitivity of $\pm 1\%$. These relays have given good service but must inevitably require maintenance and replacement of contacts.

Electronic Control Circuits.—Under the second heading there are various designs of electronic control units, but generally the method employs a voltage reference—usually a neon stabiliser, a bridge, an amplifying valve or valves and a pair of thyratrons which in turn control the motor. With modern neon stabiliser tubes it is possible to maintain the regulated voltage to within $\pm 0{\cdot}5\%$. Anti-hunt circuits are normally required in electro-mechanical voltage regulators but these are very easily arranged in electronic control circuits. Again with this type of control unit regular maintenance is necessary and replacement parts must be kept in stock.

Electromagnetic Control Circuits.—A third heading is now introduced to embrace the

electro-magnetic voltage control unit. This unit has been designed without the use of relays and valves and thus overcomes the problem of maintenance, ensuring almost infinite life. The basis of the electromagnetic control unit is the magnetic amplifier, a component which has been extensively developed and used in the last few years. Increased reliability of dry type metal rectifiers and high quality core steel have made it possible to design magnetic amplifiers, which will detect $\frac{1}{2}\%$ change in mains voltage and control the supply of current to a reversing motor. The voltage sensitive element in the control unit is a saturated iron core reactor which is compensated for the effect of mains frequency change by a simple circuit.

Analysis of Control Unit

The complete control unit, consisting of transformer, paper dielectric condensers, metal rectifiers and resistances, forms a non-deteriorating piece of apparatus without moving parts and valves. Similar sensitivities can be obtained on this unit to an electronic unit, i.e. $\pm$ 0·5% and it is independent of normal mains frequency variations of $\pm$ 2 cycles/sec. Another useful feature is that the unit will correct the mains supply as soon as it is switched on, thus eliminating the time delay experienced when switching on an electronic control unit.

The basic elements of the electromagnetic unit are similar to an electronic unit, namely a voltage dependent element, a detector, an amplifier, a power output stage and a reversing motor. The voltage dependent element is a saturated reactor and a non-saturated ballast reactor. The functions of detector, amplifier and power output stage are combined in a pair of magnetic amplifiers while the motor is a split field series reversing type. The complete circuit is as shown in Fig. 1. Mains transformer T_1 is provided with adjusting tappings on the primary side for various mains voltage levels and the output provides a centre tapped source of supply for the split field series motor M.

Each field of the motor is connected to a magnetic amplifier T_2-T_3, the function of which is to effectively "turn on" or "turn off" current in the armature through one or the other of the fields of the motor. In this manner the motor can of course be made to run forward or backward as required.

Each magnetic amplifier is parallel connected and auto-excited by rectifiers M_1 and M_2 with bias windings supplied from rectifier M_5. Adjustment of the bias current by variable resistances R_3 and R_4 effects control of the "turn on" and "turn off" point of the magnetic amplifiers, thus controlling sensitivity.

Two further windings on the magnetic amplifiers are supplied from the voltage sensitive elements through rectifiers M_3 and M_4 respec-

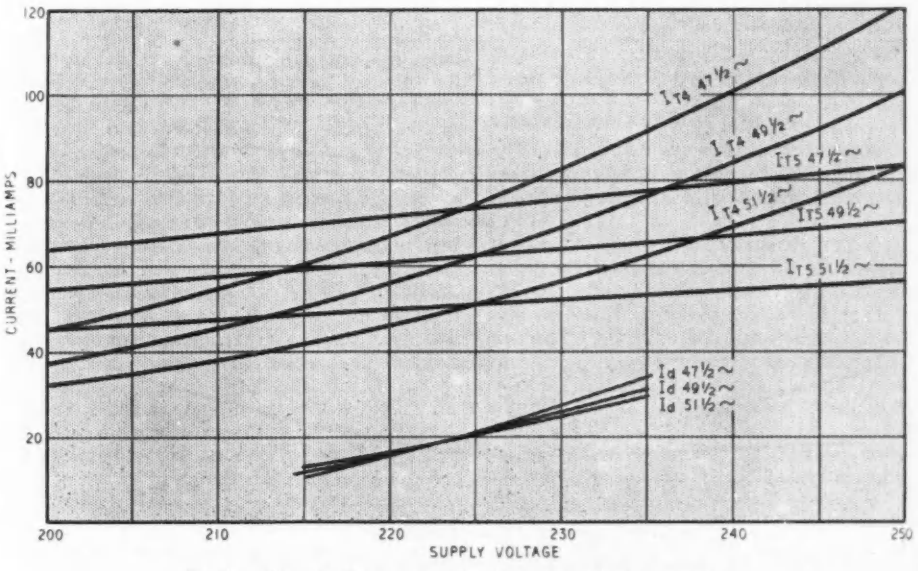


Fig. 2.—Characteristic curves of voltage dependent components

tively. The current through M_3 and M_4 is determined by the saturated core T_4 and the combination of components C_3, R_2 and the air gapped iron core reactor T_5.

Operation of Unit

With the correct nominal voltage applied to T_1 there will be saturation of the core of T_4, and its current will vary at four times the rate of the applied voltage. Elements R_2, T_5 and C_3 have a linear characteristic and their current will therefore be proportional to the mains volts. By means of the rectifiers M_3-M_4 the difference value of these two currents will flow in the control windings of the magnetic amplifiers, and at a correct mains voltage this difference current will be zero. With an increase in mains supply voltage however, the current balance is disturbed and the polarity and value of the difference current is such that one magnetic amplifier "turns on" the current to one of the motor fields, while the other amplifier maintains minimum current in the other field, the resulting currents thus causing rotation of the motor. With a decrease in mains supply voltage, the out of balance current is reversed in polarity causing the first magnetic amplifier to "turn off," and the second to "turn on" the motor, giving rotation of the armature in the reverse direction.

Since T_4 works at saturation its magnetising current will be dependent on the supply frequency, steps are therefore taken to offset this effect by using frequency dependent components in the ballast circuit. Reactor T_5 and condenser C_3 are adjusted to have the same characteristic with frequency changes as reactor T_4, thus retaining the current balance at the correct nominal supply voltage over the frequency band $47\frac{1}{2}$ to $51\frac{1}{2}$ cycles/sec.

Voltage Dependent Circuit

Use is made of the non-linear portion of the a.c. magnetisation curve of a closed iron core circuit. Curves I_{T4}, Fig. 2, show the characteristic of reactor T_4 at $47\frac{1}{2}$, $49\frac{1}{2}$ and $51\frac{1}{2}$ cycles/sec., from which it will be seen that a 1% change in supply voltage causes approximately 4% change in magnetising current. Fig. 2 also shows the current I_{T5} through the ballast circuit T_5, C_3 and R_2 for the three frequencies and the differences between I_{T4} and I_{T5} which is shown as I_d. The impedance of the ballast components T_5, C_3 and R_2 are such that the difference current I_d is sensibly zero at the nominal voltage for all frequencies. Reactors T_4 and T_5 each have two equal windings and are connected to the rectifiers M_3 and M_4 in such a manner that the instantaneous difference in the magnetising currents for the T_4 and T_5 circuits will flow in the control winding of the magnetic amplifiers. The control windings are split and are connected from the centre tap of the main transformer to M_3 and M_4 respectively. Condensers C_4 and C_5 are used for reducing the harmonic voltages at the d.c. windings.

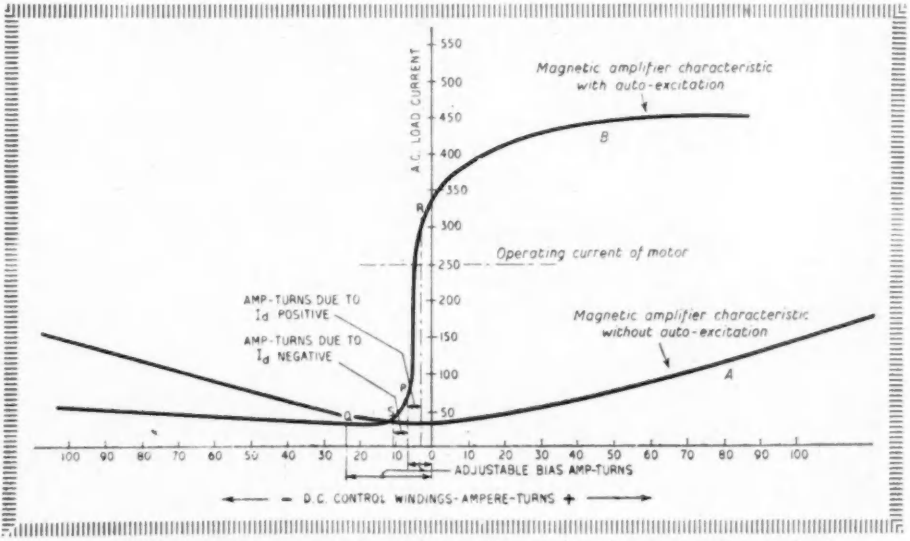


Fig. 3.—Characteristic curves of magnetic amplifiers used in electromagnetic control unit

Magnetic Amplifiers

The magnetic amplifiers in this equipment are made of high quality cold reduced anisotropic steel, thus ensuring maximum power gain and current swing. The pair of cores of each amplifier have their a.c. windings connected in parallel and their d.c. windings in series opposition. In order to obtain maximum amplification the auto-excitation connection is used as indicated in Fig. 1, the rectifiers M_1 and M_2 being used for this purpose. To give some idea of the improvement in gain obtained by the use of auto-excitation, characteristic curves of the amplifier for both conditions are given in Fig. 3 when supplying the series motor.

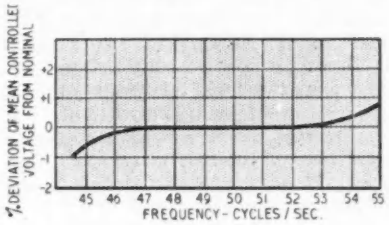


Fig. 4.—Controlled output voltage. Frequency characteristics

It will be seen that without auto-excitation, curve A, the a.c. current is independent of the polarity of the signal, but with auto-excitation, curve B, a positive signal will cause operation of the motor, while a negative signal will cause no appreciable increase over the minimum current. The amplifier therefore has the very useful feature of discrimination between positive and negative d.c. signals.

With no ampere-turns in the control windings curve B shows that full motor current would flow, it is therefore necessary to use a bias winding with an adjustable source of d.c., so that a normal working point between P and Q can be selected. Then with the correct nominal voltage applied to T_1, with the resultant perfect balance in the d.c. control windings supplied from rectifiers M_3 and M_4, there will be minimum current in the motor windings from both forward and reverse driving amplifiers and the motor will not rotate. If now the supply voltage increases this will cause a positive signal on one amplifier taking the working point from P to R, and a negative signal on the other amplifier taking the working point from P to S. This causes operation of the motor in such a direction that the regulator reduces the voltage applied to T_1. With a reduction in mains voltage the operation of the amplifiers is reversed and the motor operates to increase the voltage.

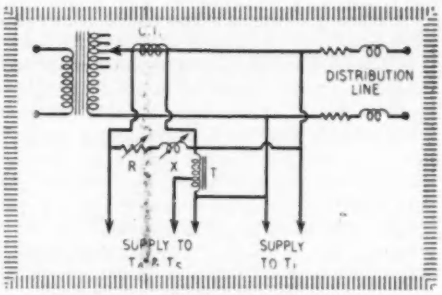


Fig. 5.—Linedrop compensating circuit

It will be seen that by altering the biasing current, point P can be moved towards Q. This will reduce the sensitivity of the equipment because a greater change in mains voltage is required to take the operating point to R.

The equipment has been designed so that maximum sensitivities of $\pm \frac{1}{2}\%$ can be obtained, but this can be increased to $\pm 2\frac{1}{2}\%$ by means of the variable resistance R_3. Condensers C_1 and C_2 are used across the auto-excitation rectifiers to reduce second harmonic voltages being developed in the d.c. windings.

It is possible to use two types of motor in this equipment, namely the two phase induction motor and the split field series reversing motor. In some applications where sensitivity is not of great importance the induction motor is quite satisfactory, but in all other applications the greater starting torque and quicker response of the series motor gives superior performance.

Characteristics of the Unit

Voltage Sensitivity.—As stated above the maximum sensitivity obtainable is $\pm \frac{1}{2}\%$ but this can be adjusted by smooth resistance control to $\pm 2\frac{1}{2}\%$.

Voltage Level.—The standard unit is provided with tappings suitable for stabilising at 200, 210, 230, 240 and 250 V. A further fine adjustment of $\pm$ 5 V is also available in the form of a potentiometer resistance R_1. Both sensitivity and fine voltage level controls can be adjusted external to the unit.

Any other voltage can also be measured and stabilised by the control unit, by using external transformers to convert the required voltage level to 230 V. The motor supply via transformer T_1 requires a separate transformer from the voltage sensitive circuit of T_4 and T_5. This transformer required for the latter is also tapped at 11 V so as to supply the voltage level adjusting potentiometer within the unit.

Frequency Changes.—The circuit is independent of frequency changes of ± 2 cycles about the mean frequency. By experience it has been found that the most useful range is 47½ to 51½ cycles. Fig. 4 shows the variation of mean level outside this band of frequency but it is not recommended that the unit be used outside the above-mentioned range. The control unit can also be designed for other power frequencies from 40 to 100 cycles/sec.

Wave-form Variation.—The introduction of harmonics in the supply voltage wave-form will have only a small effect on the currect passing in reactor T_4, since its impedance will be higher at these frequencies and the harmonic content of the supply will not usually exceed 10% total. The ballast impedances T_5, C_3 and R_2 have therefore been arranged in series so that in this circuit also, harmonic voltages will cause only small increases in the current.

The detector circuit is therefore dependent only on the fundamental component of supply voltage. Thus with a harmonic content as high as 10% the r.m.s. value will only be ½% higher than the pure sine wave condition. The control unit will therefore maintain a constant r.m.s. voltage on all normal supply systems where the harmonic content does not exceed 10%.

Ambient Temperature Variations.—Owing to the fact that the power factor of T_4 is different from T_5, it is necessary to ballast the latter with a resistor R_2 to bring them into line. This means that changes in resistance of the windings due to ambient temperature change, cause similar current changes in both T_4 and T_5 circuits, thus the effect of ambient temperature variation to the extent of 50° C is almost negligible.

Loading.—The losses and magnetising volt-amps in the control unit when supplying the driving motor are as follows:—

Motor stationary, 35 W, 100 VA.

Motor running at max. speed, 80 W, 175VA.

Tropical Use.—The unit is designed for a maximum ambient temperature of 55° C. All components are tropically rated.

Time Response and Overshoot.—For a rapid change in supply voltage the time lag before the motor starts moving is approximately 0·2 secs. When the unit is coupled to a voltage regulator however, the time response of the complete equipment depends more on the percentage correction which has to be made and the speed of the motor. These factors could be so great that overshooting and hunting would take place, but it has been found that a correction speed of 2% per second is satisfactory for most applications and at this speed no overshooting whatsoever takes place. The standard unit has therefore been designed to control a motor which will give the above stated maximum speed of correction.

Line Drop Compensation

With large power transformers it is usual to design the regulator, so that a higher output voltage than normal can be delivered to allow for the drop in volts along the distribution line. This line drop compensation voltage can be readily reproduced and injected into the signal to the electromagnetic control unit. Fig. 5 shows the basic circuit arrangement of a 230-V output line. A current transformer C.T. is connected in the output line and is loaded with a variable resistance and reactance. The latter are adjusted so that correct percentage IR and IX line drops are represented across these components. These voltage drops are connected in series opposition to the output voltage and together supply the voltage sensitive circuit T_4 and T_5 of the control unit.

Transformer T_1 is supplied direct from the output voltage line. For voltage level adjustment, an external transformer T with a 11 V tapping is used in conjunction with the fine voltage level adjusting potentiometer within the control unit. By using potential transformers to supply the control unit it is possible to control high voltage supply lines with or without line drop compensation.

Three Phase Regulators

The control unit has been designed to operate a motor capable of driving two or three ganged switches for use in polyphase circuits. The supply to the control unit will of course be single phase, and in a three phase circuit using a ganged three phase switch, this supply can be taken from any one phase. When it is necessary to stabilise all three lines this can be accom-

TABLE 1.—STANDARD RANGE OF CONTROL UNITS

Single-phase			*Three-phase*		
Voltage	*Max. Current*	*Max. Through-put.—kVA*	*Voltage*	*Max. Current*	*Max. Through-put.—kVA*
200-250	15-1,000 amps	3·75-250	346-440	15-400 amps	11·5-305
346-440	15-1,000 amps	6·6 -440			

plished by using three control units and three single phase regulators, connected preferably in star.

The dimensions of the standard control unit suitable for use on 200-250 V supplies are 18¼ in. long, 7¼ in. wide, 8½ in. high.

Applications of the Unit

It can be seen that for controlling a.c. power lines the electromagnetic control unit is an instrument of great versatility, a feature which is ideally matched when the unit is used with a tapped transformer type regulator. The range of loads which it is possible to control with this type of regulator depends on the percentage variation in supply voltage for which it is designed. It has been found however, that most requirements are met by a regulator covering + 5% to − 15% of the stated nominal mains voltage. With this in mind regulators have been designed to form a standard range for use on single phase and three phase supplies as shown in the table on page 916.

Conclusion

It is considered that the electromagnetic voltage control unit described above is an important development in the field of automatic voltage regulators since it eliminates the need for maintenance and thus increases reliability of an essential piece of equipment.

The high sensitivity and independence of supply frequency enables this control unit to be used in conjunction with the tapped transformer regulator on large or small installations supplied either from local alternators or public supply mains.

Our readers' views ...

Meter Problems

I SHOULD like to reply to R. F. K. of Plumstead who writes under the heading of "Meter Problems" in Our Readers' Views. I should like to deal with his second case of a Scott connected transformer energised from a 2-phase, 4-wire supply, running on no load, and with one of the single-phase meters rotating backwards.

I believe the explanation to be as follows: Each phase of the transformer must be supplied with a quadrature component of current (for magnetising) and with an in-phase component to supply the core loss and the no-load resistance loss. Now, since the voltages are already in quadrature, the quadrature component of the current in the leading phase becomes an in-phase component for the lagging phase. Now, if the quadrature component is greater than the in-phase component (it almost certainly will be) the power requirement of the lagging phase will be *more than supplied* from the leading phase. In other words the lagging phase must export power, and it is this which causes the meter reversal. It should be noted that this transfer of excess power between the two phases (which are actually two separate systems) can only take place with a common core Scott transformer and the phenomenon would not be observed on two single-phase units connected Scott fashion.

It will be appreciated that this transfer of power from phase to phase does not take place with a high degree of efficiency due to the magnetic separation of the phases provided by the centre limb of the core, and it is only that component of the core flux which is common to both outer limbs that is instrumental in bringing about the effect. R. F. K.'s first problem can be explained in the same way.

R. Wells
WALTON-ON-THAMES A.M.I.E.E.

◆ ◆ ◆

Container Heating

I WAS extremely interested in Mr. A. D. Gilbert's letter (ELECTRICAL TIMES, September 11) claiming a power factor of 90 per cent. in the majority of his induction heating installations. In case the matter has not been brought to his attention may I say that a paper on this subject will be read in Manchester on January 20 and in Leeds on February 17 before the Institution of Electrical Engineers.

Two years ago I met a man who had an idea for improving the power factor of induction heating installations which he wished to patent. I promised him that I would not reveal the method and I have, therefore, never done so. I formed the opinion at the time that the cost of the method might possibly make it uneconomical.

C. A. M. Thornton
HARTFORD, CHESHIRE

23 miles of Cold Cathode Lighting

Largest in the World is claimed for this C. A. Parsons Installation

CLAIMED to be the largest in the world is the cold cathode lighting system now nearing completion at the Heaton Works of C. A. Parsons and Co., Newcastle-on-Tyne. This project began some six years ago and was planned by the firm's engineering department, in co-operation with the G.E.C. who supplied the Osram tubes, lighting fittings and auxiliary gear. Altogether a floor area of 454,000 sq ft of engineering workshops has been illuminated so far, and the final section, a new research building covering 120,000 sq ft will be finished in 1953. Over 23 miles of cold cathode tubing will by then have been installed.

The reason for selecting cold cathode is mainly financial. The maintenance costs of this system are low, the crane time lost in changing lamps is reduced, and the lamp life, some 15,000 hours is long. In addition the excellent, even, general lighting from an extended source renders the use of local tungsten lighting for individual machines unnecessary, and finally, the absence of unwanted shadows and glare makes working conditions more congenial.

A Special Fitting

A special heavy duty fitting has been employed throughout, mostly with a triple tube arrangement, but in some cases four tubes in the same fitting have been found both technically and economically more suitable. The fitting is completely self-contained with a 3-pin plug and socket arrangement for connecting the normal mains. Overall consumption of the 3-tube arrangement is 250 watts and standard Osram 9 ft 6 in. tubes (lighting length 8 ft 6 in.) of "Intermediate" colour, are used throughout. The reflectors, of vitreous enamel, are built in two 4 ft 3 in. lengths and can be removed for cleaning without disturbing the lighting tubes. Average illumination level in the foundries, pipe division, and condenser bay is about 9 lumens/sq ft, rising to 14 lumens/sq ft in the turbine blade rolling and assembly and machine shops, 12-15 lumens/sq ft in the new transformer shop, and 50-60 lumens/sq ft in some of the research laboratories.

Above: The scene in the turbine blade rolling shop

Right: The giant installation in the turbo-alternator erecting shop. It can be seen that the general level of illumination from the lines of light is such that all local lighting can easily be eliminated

Power from Low Grade Heat

A Turbo-Alternator operating with steam at 4 lb/sq in. absolute

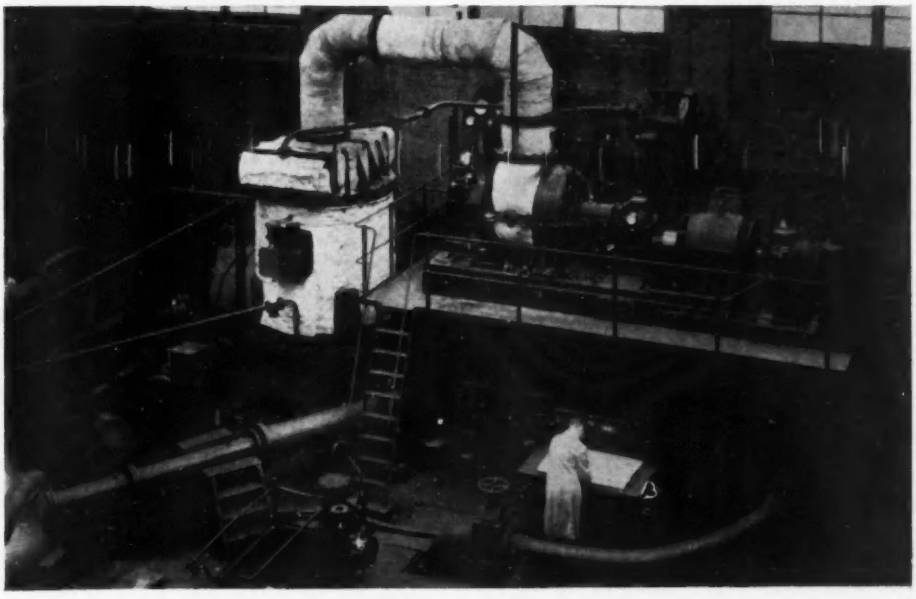
IN the heart of the Belgian Congo, a tin mine is being opened, situated over 100 miles from the nearest settlement, and 2,500 ft above sea level. Under these circumstances the generation of power from ordinary fuel is expensive due to transport costs. In consequence the Societe d'Exploitation et de Recherches Minieres au Katanga investigated the possibility of using hot spring water, available in the district, as a power source. Preliminary investigations showed the quantity of hot water and temperature to be fairly constant at a given datum overflow level. The quantity is about 31,750 gallons/hr, at a temperature of 196° F. By lowering the natural overflow, the quantity could be increased to about 55,500 gallons/hr at 200° F. Cold water is also available on site from a reservoir about 600 ft away from the hot spring and 20 ft or so higher. The quantity available is dependent on the rainfall but during the greater part of the year 127,000 gallons/hr is available at 74·5° F.

It was accordingly decided to contact turbine manufacturers with a view to obtaining a sub-atmospheric plant to utilise these heat quantities and temperature difference. After some difficulty in finding a firm to undertake the work, Messrs. Belliss and Morcom, Ltd., were approached, who decided to build a plant to produce 220 kW as a normal load with normal flow and with an overload capacity of 275 kW with the increased hot water flow.

Provision on site had to be taken to ensure a continuous supply of cooling water, and a large natural storage reservoir could be arranged below the power station level, which latter was more or less fixed by the datum overflow of the hot spring. As the load is not constant, being about 200 kW for the day shift and 150 kW for the remaining 16 hours, three pumps were installed to use the off-peak power to circulate the warm condenser water from the lower reservoir back to the upper reservoir via, if necessary, a mechanical water cooler.

Basic Design

As the hot water inlet temperature is fixed by the spring temperature, and the exhaust steam temperature is limited by the outlet cold water temperature, there must be some optimum value of the temperature drop of the hot water to produce the steam and the heat drop through the turbine. The temperature of steam generation for this optimum value at 220 kW load



is 158° F corresponding to a pressure of 4·5 lb/sq in. absolute, and after allowing for a drop of 0·25 lb/sq in. in the steam supply between the evaporator and the turbine and 0·25 lb/sq in. in the governor valve, 4 lb/sq in. is left as the resulting pressure in the turbine chest. A vacuum of 28·64 in Hg (bar 30) with the cold water at 74·5° F is available at the turbine exhaust.

In any plant of this nature, the air pump is of vital importance. As no external current is available, a pilot set is required for starting purposes, and as a small amount of wood fuel is available, a steam plant was selected. This small plant feeds a steam jet air pump, the heat from the exhaust being reclaimed in the steam to the turbine. To maintain vacuum as high as possible, all potential sources of air leak have been reduced to a minimum, and barometric legs are used for the removal of hot water from the evaporator and the condensate from the condenser. Vertical, drowned pumps installed at the bottom of the tailwell are used for the removal of this hot discharge water.

There are two pumps, one pump for the normal hot-water flow and a smaller duty pump for starting and to assist the normal duty pump under overload conditions. These pumps are designed to cater for the following conditions: low power consumption on light loads; maintenance of the water level in the tail well within prescribed limits; for output on demand in excess of normal full load conditions and to give characteristics suitable for running in parallel.

On starting, a small duty pump is connected to the auxiliary generator, and the output from this is sufficient to keep the level of water in the tailwell low enough to enable the turbine to start and run on light load. When the turbine is up to speed, a larger capacity pump driven from the alternator cuts in, and an automatic control takes over to keep the level of water in the well between predetermined limits.

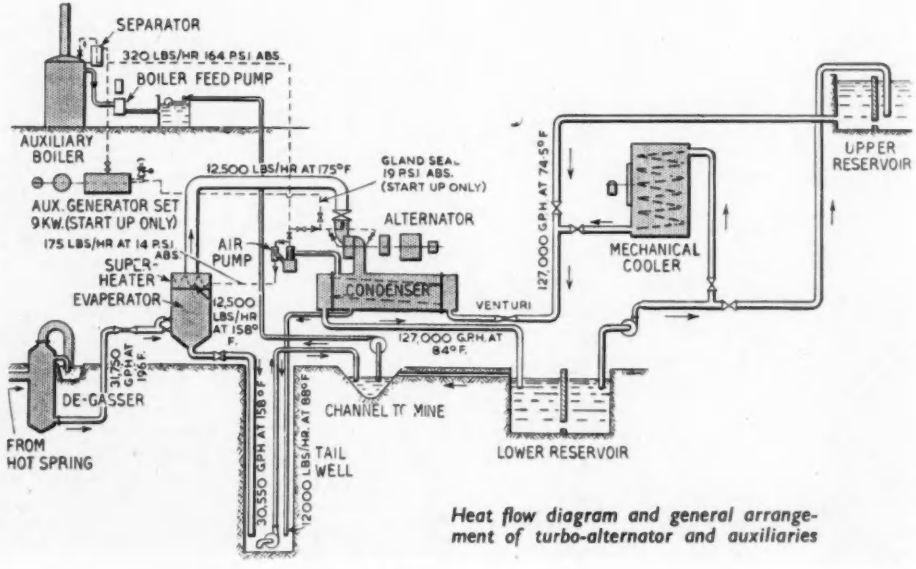
The auxiliary boiler plant, which drives a single-crank two-cylinder tandem reciprocating steam engine, also provides the necessary steam for the glands, either from the boiler or from the exhaust of the steam engine.

A fortunate feature is that the hot spring water is remarkably pure, and being slightly alkaline can be used as make up.

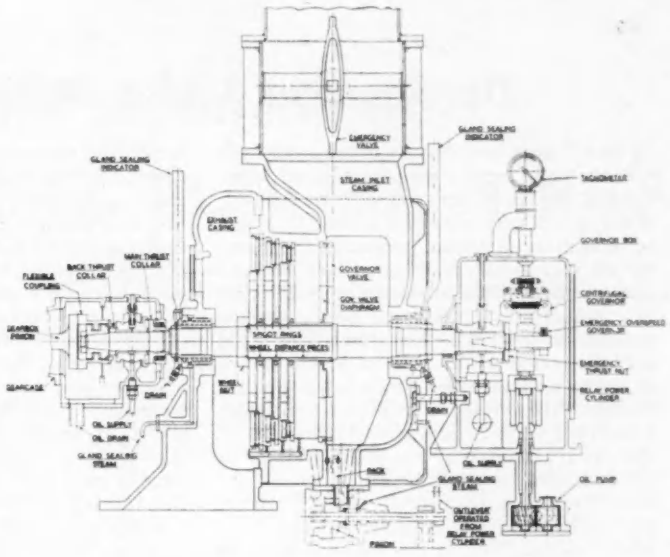
The analysis shows that it contains no acidity and very little hardness. A small vertical spindle motor and pump has therefore been installed over the hot water discharge channel and delivers through a ball-float valve to the feed tank in the boiler annexe. This annexe also contains the pilot engine with its feed pump.

Plant Construction

The evaporator, of welded steel construction, has two groups of stainless steel nozzles in the lower portion, one group of which is used for normal load, the other coming into operation for maximum output. Supply to the latter is



Heat flow diagram and general arrangement of turbo-alternator and auxiliaries



This view gives the longitudinal cross section of the turbine. Main points of interest are the gate type governor valve, gland steam sealing arrangements and the size of the inlet belt

SECTION OF STEAM TURBINE PRODUCING 220 KW NR-275 KW MAX FROM HOT WATER AT 190°F INLET PRESSURE 4½ LBS P.S.I. ABSOLUTE — EXHAUST VACUUM 28·64 ins — SPEED 4500 R.P.M.
BY BELLISS & MORCOM LTD
FOR SOCIÉTÉ D'EXPLOITATION & DE RECHERCHES MINIÈRES AU KATANGA

controlled automatically by an Arca valve which operates when the pressure drop across the turbine governor valve falls below that applicable to full-load duty. Suitable emergency vacuum breakers are fitted to prevent flooding. Superheating is carried out in the head of the evaporator using flashed steam from the air ejectors. To prevent heat losses all main piping and the evaporator are lagged with asbestos mattresses provided by the Darlington Engineering Co.

The power unit comprises a 4,500 r.p.m. turbine driving a 1,500 r.p.m. L.D.C. alternator through David Brown gearing. All this plant is mounted on the condenser. The turbine itself follows fairly conventional lines and has three stages, approximately equal to the last three stages of a 1,000 kW impulse machine. Some difficulty was experienced with the inlet stage on account of its size as compared with the turbine proper, and to overcome this a gate-type governor valve, as used for pass-out sets, was introduced in place of the normal type. Special care was also taken in the design of the glands, as the whole set necessarily runs at sub-atmospheric pressure.

Starting

It was thought that quite a burst of steam would be necessary to start up the unit, but, on test, starting was found to be simplicity itself. A moderate vacuum was produced in the main condenser by means of the second stage ejector. With the governor valve wide open and the emergency valve shut, the design clearance around the emergency valve was sufficient to transmit the vacuum from the condenser to the evaporator. On admitting hot water to the evaporator, steam was generated and the evaporator pressure rose above that obtaining in the turbine valve chest. Then, by partially opening the emergency valve by hand, the pressure in the evaporator fell, providing the necessary conditions for the continuous generation of steam and starting the turbine.

Measuring and recording equipment is installed to ensure that full advantage is taken of the heat supplies available, and indicators and alarms are provided as safety measures.

Testing of this unusual plant was something of a problem as the site conditions had to be reproduced with good accuracy. To provide hot water at the right temperature steam was admitted through nozzles into a large water tank, the level of the tank being maintained at the same height, relative to the evaporator as the natural overflow of the hot spring. Cold circulating water was obtained from the normal test house source and special arrangements were made to recirculate a portion of the cold water passing through the condenser to simulate the heat transfer conditions obtaining on site. As the height available at Belliss and Morcom's works did not permit the provision of a tailwell, the hot water from the evaporator was pumped out and recirculated to the tank by means of a large capacity water pump. Condensate from the main condenser was also removed by pump and discharged to the weightank. The test layout, although complicated, proved very successful in operation after a few initial troubles, and the design performance was established.

Development Under Difficulties

APART from troubles due to breakdowns in its bulk supply the Christchurch City Council Electricity Department, New Zealand, is having difficulty in keeping to the 5% annual increase in consumption, judging by the report for the year to March 31 last, which we have just received. The undertaking sold over 252 million units during the twelve months covered by the report—an increase of 6·2% over the previous year, despite the imposition of severe restrictions on consumption for five months. These restrictions became necessary following a series of accidents. Firstly, part of the main transmission line from Waitaki to Christchurch was washed away by floods (and took seven days to restore); secondly, flood debris greatly reduced the capacity of Highbank power station; thirdly, the new generator at Tekapo developed a mechanical fault, and lastly, water storage became critically low.

At this period consumers were asked to save 20% of the normal allocation. Not surprisingly, revenue for the year dropped by about £19,400, but the reduction in the peak load brought its compensation in a lower charge for bulk power. As the result, the surplus for the year covered by the report was increased by over £9,000 to £22,068.

In Christchurch the load is predominantly domestic—of a total of 497,765 kW connected 393,346 kW relates to domestic consumers, and these accounted for over 174 million units during the twelve months at an average price of 0·559d. p.u. With more appliances available the turnover of the showroom increased, and a further advance was made in installing new equipment. An additional 1,547 domestic electric cookers were connected, bringing that total to 29,546, while the water heaters served number nearly 30,000 also. This in an area with 44,415 residential consumers.

In his report, Mr. J. C. Forsyth, engineer-manager, stresses the difficulties encountered by the Department in carrying out extensions to new residential areas being developed. Apart from the higher costs of materials, he refers to the "indefinite time required for the delivery of supplies from overseas countries." Yet despite such troubles, it is evident that the undertaking is rapidly progressing.

PROGRESS IN GAS SUPPLY

PUBLISHED a month after the B.E.A. report, the report of the Gas Council for the same period provides some interesting comparisons with the earlier document. During the period covered, the Gas Boards sold 2,513 m. therms of gas, an increase of 2·1% on the previous year. The corresponding increase for electricity was 8·2%. Financially, the gas industry recorded a net surplus of £1,440,916, compared with £1,506,026, on a turnover of £261 m. On the subject of commercial policy, the report suggests that there are two main objectives: the improvement of services to the consumer and the education of gas consumers in the most efficient and most economical use of appliances. The Gas Council's Commercial Managers' Committee, which advises the Council on commercial policy, has given special attention to the marketing and servicing of water heaters.

That the gas industry has its peak problem, related to a period of weeks rather than hours, is evidenced by a lament over the effects of steel shortage. Fears are expressed that in the absence of an improvement in the supply of steel for new manufacturing plant, the ability of the industry to meet the requirements of existing consumers, "particularly at the peak season," would be prejudiced.

Cooker Progress

Special priority has been given by the boards to new housing estates in the allocation of limited materials. The result of this drive to "ensure that gas shall be available to all who desire it" has been rather startling in some instances. In the area of the North Thames Gas Board, all the 18,000 dwellings built by county and local authorities are stated to have been piped for gas, and in 85% of them tenants "chose" gas for cooking; and half of them were equipped with gas wash boilers. In the Northern Area, with coal acknowledged as the main competitor for cooking, out of 12,206 houses completed, 81·5% had gas and 70·8% used it for cooking. Finally, in the South Eastern Area, 92% of the 18,600 houses completed had gas laid on, with gas cooking the choice in 85% of these cases.

Repair and Maintenance of SMALL ELECTRIC TOOLS

Testing and Repair of Brush Gear and Commutators is discussed in the final article of this series by KARL WILKINSON

THE maintenance man is not concerned with the extremely complicated design and research that has gone into commutators and brush gear. It is his job to ensure that they are in the condition the makers intended them to be unless they can obviously be improved. This last statement may be rather surprising. In spite of the excellence of most modern tools, certain models had teething troubles and some were discontinued. We shall refer again to this point later.

Brush Gear

Brush gear in small tools can be divided into various categories:

Cartridge type. These brush holders consist of a metal body with a round or rectangular hole through it and housed in an insulating tube, either of turned material or of moulded synthetics. The assembly passes through the body wall and is frequently held in position by a small grub screw. In dirty machines they are very liable to develop shorts to earth by tracking over the accumulated carbon dust. See Fig. 40. The illustration shows how to remove the brush boxes. Burnt places can be repaired by grinding away the damage and building up with sealing wax. When hard this material can be filed or machined up to size. (*N.B.*—We do not assume that the repairer has in stock every type of replacement part that he may require.)

Be careful of light weight die-cast housings. Cracks may develop around the brush boxes and the metal may split when the boxes are pressed out. In order to replace the repaired part it may be necessary to turn up a fitting pin with two shoulders, one to engage the insulating tube and the other to take the metal insert, thereby permitting insertion by pressure and preserving their relative positions.

Square boxes with square insulating tubes are more difficult. Damaged insulation can be replaced by adding four separate pieces with mitred corners, stuck on with shellac or bakelite varnish. Do not use red fibre unless nothing else is to hand. Red fibre is a very poor insulator when damp. Bakelite or "Paxolin" sheet is far better. Alternatively thin paper (presspahn) covered with one of the two varnishes mentioned above and allowed to get tacky, can be wrapped tightly around the metal tube and baked to harden it. It is then filed to shape and refitted.

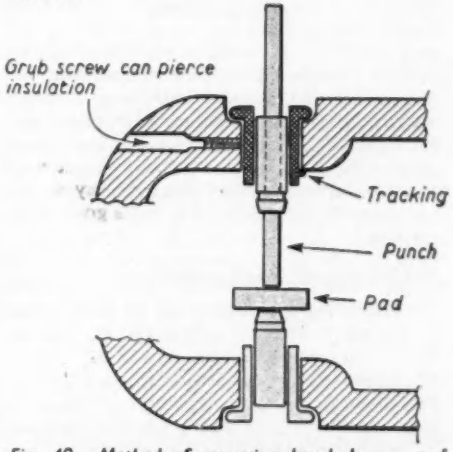


Fig. 40. Method of removing brush boxes, and the position of possible faults

The small grub screws must not pierce the insulation and the screws sometimes used to affix the lead to the brush box must not pass into the tunnel and foul the brush. The box itself must be fitted with the tunnel in line, axially, with the armature.

Die-cast boxes. This type of box, if the tool has been in use for some time, can be troublesome. The die-cast metal, as a result of mechanical wear, atmospheric corrosion, especially near the sea, and by the passage of stray currents may develop a surface that is partially non-conducting and if the pigtail from the brush is faulty, arcing may take place between the box and the brush. Some electric drills are

fitted with these boxes which also have a tailless brush, current being conveyed partly by a clock spring. If this flat spring is also corroded the combined resistance may be high enough to prevent the motor operating at all. Little can be done to such boxes when they are badly

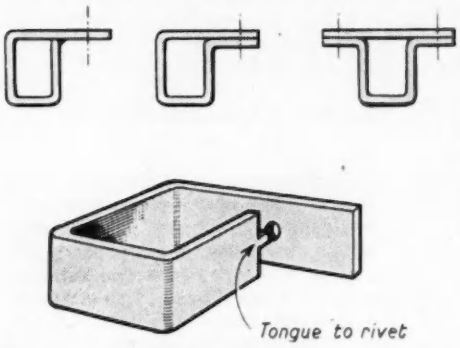


Fig. 41. Method of fabricating replacement pressed brass brush boxes

worn. If new ones are not available they can be built from brass sheet; see next section.

Pressed brass boxes. This is a common method and many makers use their own particular design. When new and of good design, they are quite satisfactory, but wear and possibly mechanical damage may so distort them that it is difficult to get a good fit for the brush.

Improvised Replacements

As these pressed metal boxes are so frequently damaged—not by legitimate use but by violent treatment; we have all met the inquisitive ignoramus who has poked a screwdriver into the motor—they must on occasions be made up when replacements are not available.

They are quite easy to make even if of complicated design as long as one or two points are remembered. First and foremost the brush must be of good fit in the box and the best way to start the job is to make a steel dolly or mandrel the same size as the brush in question, over which the brass is closed.

The brass should be softened and allowance made for its thickness when bending corners. As most of these built up boxes are wrapped, some method is required to fix the last side to the base. This can be done in various ways such as shown in figure 41. Cut aways and profiles are easily made with a jewellers' piercing saw.

Moulded boxes. These are generally similar to the cartridge type box described above. Some of them, however, are made without any metal lining. This makes it imperative that the brush is provided with a tail to prevent current flowing via the spring. Contact is made by a metal tag under the brush cap.

The repairer should always be on the watch for these tails and he must not assume that the brush he takes out while dismantling is either the original or a correct replacement. Moreover, the brushes must bed on the commutator face and not overhang the edge or foul the rises. See Fig. 42. In (*a*) it will only be a question of time before the armature collapses due probably to the solder on the rises bridging over and shorting out the winding; while in (*b*) the overhanging lip may foul the mica cones that often project slightly and prevent the brush bedding, so leading to violent sparking and burning out of the armature.

Both these faults can be caused by the armature being out of position, due either to (1) taking up slack in bearings or (2) incorrectly fitted armature. A similar misalignment can also occur as in Fig. 43, where the stampings of the armature do not coincide with those of the fields. This will reduce the output of a machine and cause it to run hot and faster.

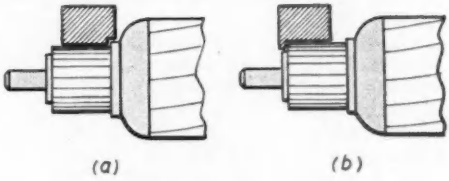


Fig. 42. Incorrect positioning of brushes

(In squirrel cage motors and in true repulsion induction an out-of-alignment in the stampings may cause an enormous increase in input current.)

Certain inferior makes of apparatus often have this misalignment as an inherent fault.

Brushes

We hesitate before we lay down rules for the correct brushes. The subject is far more complicated than most repairers realise and we have available at least 2,000 different grades. As a result, the repairer must follow the makers' example and use a correct replacement. Failing this, get as near to the grade as possible. Don't, unless absolutely stuck, replace say a link C4 with a link B from an old car dynamo. If the machine is absolutely unknown experiments are justified. Try an EG4 or failing this write to the *brush* makers and give all particu-

lars of the machine, size of commutator, speed number of commutator bars, etc., etc.

Assembly

With all the parts clean and all mechanical repairs effected the machine is ready for assembly. It is advisable to assemble any rotating unit dry at first as, thereby, any slackness is much more noticeable and roughness in bad bearings readily discernible. This is imperative when a new P.B. bearing has been inserted and requires reamering or scraping to fit. A minute spot of lubricant from the fitter's hand will be sufficient to show a rub in the bearing. The shaft can, if necessary, be blued. Scraping is often required in fitting very small bearings as reamering is not always possible or desirable. In any case an in-line reamer with a guide should be used whenever possible and these are seldom available below $\frac{1}{2}$ in.

End play can now be taken up, either by adjusting the outer race, shimming the inner race on the shaft, or by adding shims to a plain shaft. If fibre shims are used do not fit too tightly as the fibre swells and may seize up after a run.

Avoid if possible a brass shim next to a brass bearing.

First Test

With all mechanical fitting complete the machine should be insulation tested and put on test with an ammeter or better, a wattmeter in circuit. Many makers will give, either in their catalogue or stamped on the label, this information. Some will give idle watts, which is most useful for checking the tightness of bearings, and general conditions, but most of the data is for full load. This can be rather questionable as the normal full load on, say, a drill or sander will vary according to the pressure applied. Moreover, the condition of the drill will naturally affect the current consumption and this is particularly the case with portable circular saws. A blunt saw in a blind cut can increase the load enormously.

It is, of course, assumed that any tool added to a machine is of the correct size. To take an extreme case we have all met the $\frac{1}{4}$ in. drill using a $\frac{1}{2}$ in. drill with the shank turned down! Less obviously, in a blower, overloading can occur when for example a fan has been replaced by an incorrect one or the fan may be quite correct but the angle of the blades may have been altered, so affecting the performance.

If a motor is being run without any load whatever, such as a blower, vac, or drill minus gear head, the speed may be so high as to endanger the windings if left running for a long period. Some motors will run up to 22,000 r.p.m. without a load. Moreover some machines may spark violently at the brushes at these excessive speeds. One paint sprayer in particular may exhibit such a flare of sparks from the commutator when run without the impeller that the armature is immediately under suspicion, but the addition of the load will make matters normal. Similarly a vacuum cleaner without a bag or tube may take 250 W, but when assembled the consumption drops to 220 W.

Brushes and Sparking

This question of sparking leads us on to the brushes. Many machines may spark a little for the first few revolutions until the brush beds in but should not give any trouble if all the electrical parts are in order and the correct brush is used. If a new brush is not already ground to the correct curvature it must be bedded in. Commstone is most useful but *must not be used to excess*, and any surplus should be blown away with an air line. The repairer will soon discover many tools where it is more or less impossible to get at the commutator to bed the brushes in. He may be able to insert a thin wood stick bearing a small piece of commstone inserted in the end or side into one of the ventilating holes in the housing. In a perfectly blind commutator end housing the brush must be bedded by hand, that is insert it to get a rub and scrape or fit in the usual manner. Always leave the middle slightly hollow and let the outer edges of the brush

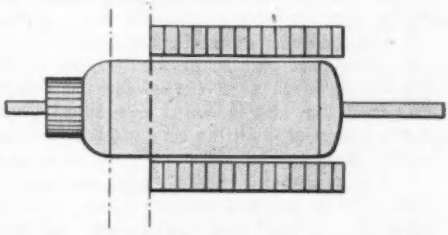


Fig. 43. It is necessary to ensure that armature and field stampings are aligned as shown in this sketch or output will be reduced

bear first. Simple devices for grinding brush faces have often been described, but are only suitable for one diameter of commutator.

Let us refer back for a moment and consider the test run mentioned in a previous section before the machine was dismantled. If an armature has an open circuit a flare from the commutator is almost certain, if it has more

than one open, it may not start unless turned to a certain position. If the armature is short circuited very little sparking may be observed but the current and heat will rise and speed fall. If one brush flares and the other is reasonably good the trouble is probably in one field coil. We are, of course, assuming that the mechanical parts are sound.

If everything is apparently in order and yet the machine still sparks, make sure that it is rotating the correct way. (The actual direction may not matter, mechanically, in some machines.) Opposed fields will give very slow speed and high current. A dual wound d.c./a.c. series motor will run very slowly and without much power if the a.c. is fed into the d.c. field connection and vice versa.

When a new part, such as an armature or field assembly, has been fitted, make sure that it is of the correct voltage. Some makers use a code number for every model and voltage range, while others use the same code number such as 1359E followed by the voltage which might be 200/230 or 220/250.

In general a fault will give high current, low speeds and little power. The colour of the sparking at the commutator can be misleading and similarly the colour of the commutator face will vary enormously according to the machine and to the machine duty cycle. Much has been written about these last two points, especially on the condition of the commutator face, but no hard and fast rule can be given.

Noise

The source of excessive noise can usually be traced with little trouble, unless the machine contains a number of bearings and races, when the faulty part may be difficult to locate. A screwdriver used as a stethoscope is a well known dodge and is worth repeating. Gear heads, when old, will be very noisy and little can be done apart from complete replacement of all worn pinions. Perhaps an example of obscure noise is to be found in a simple machine with two normal races that may actually scream when up to speed and yet on dismantling everything may appear to be apparently sound. Try replacing the bearings—they are probably bad. Similarly a race loose in the outer housing will also scream.

The heat of the motor is another problem. A high temperature is obviously incorrect, but not if the motor has been taken out of its housing where it was perhaps cooled by additional air circulation. The heat of a motor will depend upon the ambient temperature and the duration of run under full load. Many small machines are intended for intermittent use under normal circumstances such as drilling a few holes, with a pause to mark off and so on. Unfortunately, many workshops will purchase a light duty machine, even the "home kit" variety because of its competitive price, and install it or even jig it up for long runs of repetitive work. The motor is often unsuitable for such a duty.

This brings us to the one weakness of the portable electric tool. They are so successful that the operator—used possibly to tiring manual work—will push away quite merrily without resting and it is an electric tool that suffers the fatigue ! A manual worker requires a rest, so do most tools unless specifically designed for arduous duty.

PROPHECIES FOR INDUSTRY

AFTER the dinner dance of the I.E.E. Measurements Section held last year, this year's event, a dinner and reunion, which took place last week, had more of the spirit which characterised former functions of this nature. Proposing the "Guests," Dr. Hartshorn referred to the truths implied by Col. Leeson in his presidential address. The message of harder work, more engineers and increased power had a refreshing spirit, in the nature of a bracing draught. Turning to the other principal guest, Mr. Hall, Dr. Hartshorn recalled an earlier association of the Section with the Director of the Royal Aircraft Establishment in his paper on servo-mechanisms and the offer of Farnborough for their summer visit this year.

The first to reply, Col. Leeson complimented both the Section and its chairman for their current activities, saying that they always contrived to match the burden to those who carried it. Of the future he felt that prospects for instrumentation were far from inconsiderable when one considered the American practice of greater instrumentation, enabling quite large plant to be operated by technically inferior men.

Following Col. Leeson, Mr. Hall suggested that R.A.E., a confluence of government science and private enterprise, represented by the aircraft industry, might set a pattern for the increased spread of knowledge in engineering industries generally. From this source came the right type of engineer who, willing to learn and prepared to take chances, was the ideal material for continued progress. Given the right type of people, the aircraft industry for one, had a great future. If, in the last 50 years it had climbed from zero to the speed of sound, was it not possible that in the next five years it would attain double that speed ?

Mr. Coales proposed the toast to the chairman. In replying, Dr. Hartshorn expressed his congratulations to Professor MacGregor-Morris, who, only last week, celebrated his eightieth birthday. He also paid compliment to Mr. Steel for the smooth running of the section.

PROBLEMS AND PRACTICE in Engineering

Intermittent Fault

AT least once a month a call was received that a two-ton fully automatic lift was refusing to start correctly in the up direction when the call button was pressed and consequently the main circuit-breaker was tripping. The fault in question was so intermittent that when the engineers arrived the lift was found to be working satisfactorily, and under no circumstances would repeat the fault, but later the fault became more frequent.

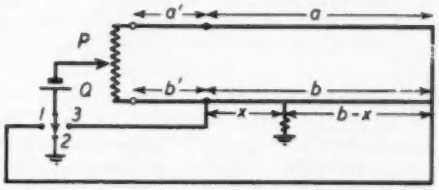
Each item of the electrical equipment was inspected and in turn the main control panel was examined but no burnt contacts or open circuits could be traced. The symptoms threw suspicion on the main lifting motor which appeared to be single phasing when starting but cleared when running at high speed. A lamp was fitted to each phase of the motor and one was observed to glow dimly for about five seconds on starting. The controller was re-examined and it was found that when a combined arc shield and blow-out coil on the hoist contactor was placed into a certain position, it fouled a contact sufficiently to cause an open circuit on one phase to the motor. When the lift was operated in the down direction, the vibration set up by the contactors closing circuit was sufficient to lift the faulty arc shield and thus enable the hoist contactor to operate correctly. It was found that when the shield was placed in its correct position the faces of the contacts could not be observed, but when pressed in by hand appeared to be making correctly. Had the contact remained open less time would have been taken.—*P. S. Hussey.*

Slide Wire Bridge Fault Localisation

THE slide wire bridge used for fault localisation on power circuits generally has a resistance in the range of 2-20 ohms. Due allowance, therefore, must be made for the effect on the instrument calibration of connecting leads when they are arranged as an extension of the slide wire circuit. Alternatively, the connecting leads term can be eliminated from the "distance to fault" calculation along with the equivalent length of the sound core.

Two methods of doing this have been described ("Sigma," ELECTRICAL TIMES, August 9, 1945, page 187, and G. W. Stubbings, *Electrical Review*, October 18, 1946, page 603). Both methods, however, involve interchanging the leads to the sound and faulty cores, a procedure that does not exactly commend itself.

The present method achieves the same object without any alteration to the lead connections.



Connections from switch to faulty cable

In the diagram, the connecting leads and cable loop have resistances designated a^1, b^1, and a, b, respectively. The battery switch indicates that three tests are made, for which the slide wire settings are P_1,Q_1, P_2,Q_2, and P_3, Q_3.

Let x = resistance to fault from testing end, and $R = a^1+a+b^1+b$, the total loop resistance.

It is known that:—

$P_1+Q_1=P_2+Q_2=P_3+Q_3$—call this value C.

The balance conditions are:—

(1) $\frac{Q_1}{P_1}=\frac{b^1+b}{a^1+a}$ whence, $\frac{Q_1}{C}=\frac{b^1+b}{R}$

(2) $\frac{Q_2}{P_2}=\frac{b^1+x}{a^1+a+b-x}$ $\frac{Q_2}{C}=\frac{b^1+x}{R}$

(3) $\frac{Q_3}{P_3}=\frac{b^1}{a^1+a+b}$ $\frac{Q_3}{C}=\frac{b^1}{R}$

From the above:—

$$b^1+b=\frac{Q_1R}{C};\quad b^1+x=\frac{Q_2R}{C};\quad b^1=\frac{Q_3R}{C}$$

Substituting for b^1

$$b=\frac{Q_1R-Q_3R}{C};\qquad x=\frac{Q_2R-Q_3R}{C}$$

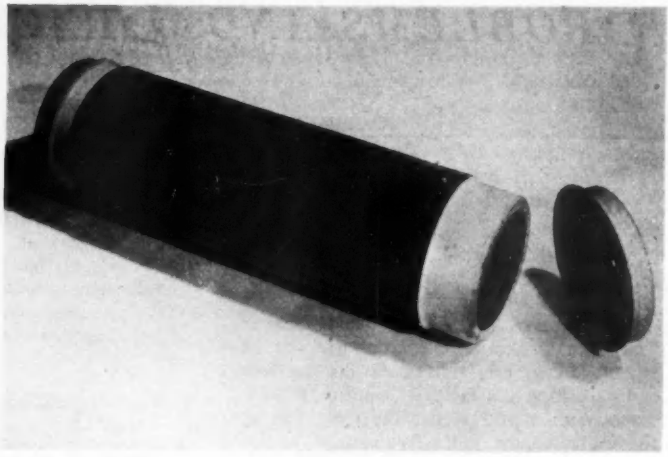
$$\therefore \frac{x}{b}=\frac{R(Q_2-Q_3)}{C}\cdot\frac{C}{R(Q_1-Q_3)}$$

$$x=\frac{Q_2-Q_3}{Q_1-Q_3}\,b$$

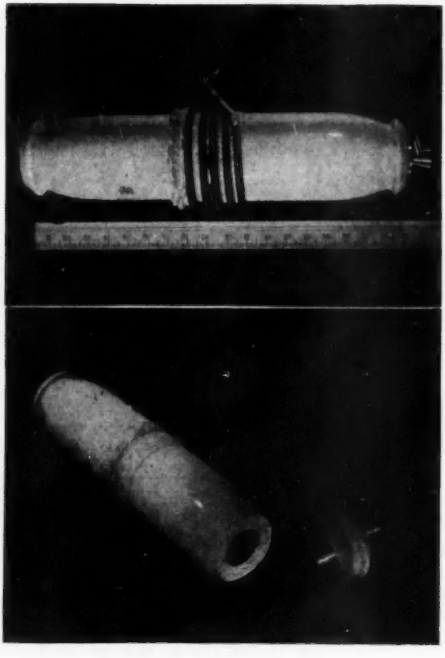
If b is of uniform sectional area and L its route length, it is only necessary to substitute L for b in the formula to obtain the distance to fault.—*J.L.G.*

Adhesives for Porcelain

Thermosetting Synthetic Resins provide new scope in Design



THERMOSETTING synthetic resins are gaining increased popularity in view of the ease with which they can be applied, indicated by uses to which "Araldite," produced by Aero Research Ltd., is now being put in electrical engineering. Under the name "Araldite" is manufactured a variety of thermosetting resins of which the basic type is available in a powder or solid form requiring for its curing, application of heat at 190° C for about one hour.



One method by which the comparative scarcity of large porcelains used for insulator construction has been overcome is by building such structures from smaller sizes of porcelain. Requirements for adhesives put to this use are somewhat critical, of which high shear and tensile strengths and resistance to shock are the more obvious. In addition a relatively simple adhesive curing technique is required as prolonged thermal curing with considerable pressure applied to the join is out of the question.

Porcelain fails before joint

Experience of the Metropolitan Vickers Electrical Co. has shown that "Araldite" complies very largely with these requirements, indicated by illustrations reproduced on this page. The simplicity of the curing technique is adequately demonstrated on the left, in which heat is applied to the adhesive joining two ceramic cylinders using a sheathed heating element round the porcelain. No pressure need be applied. When subjected to tensile tests, it is stated that failure, in all cases, was in the porcelain and not the join. Although experiments have been so far on a small scale there is little, apparently, to prevent large-scale application of these methods.

Another application in which "Araldite" has proved satisfactory is shown in the heading illustration, where the resin is being used to bond metal to porcelain. In this case a cold setting variety has been used, requiring a hardening additive but a temperature of only 90° C for its curing, although the joint is weaker than the hot-setting type. Where however this lower strength can be tolerated, the prospect of effecting satisfactory adhesion at the lower temperature becomes immediately attractive.

Testing Welded Rotors

150kV X-Ray Equipment has Extended Anode for Insertion in Small-Bore Tubes

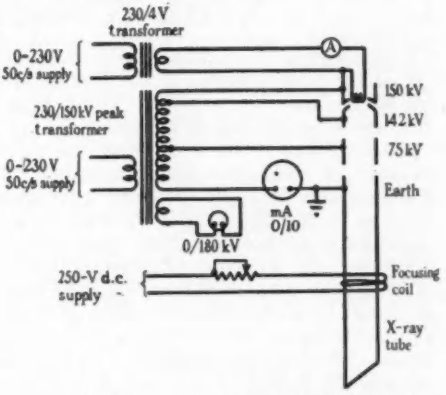
EXTENSIONS in the applications of welding require corresponding developments in radiographic technique, so that the necessary inspection can be carried out conveniently and speedily. An example of the type of development involved in this work is given by a recent problem which faced Metropolitan-Vickers, where circumferential welds in gas-turbine rotors had to be inspected. Radium capsules were used originally, but exposures of over two weeks in duration were necessary. The development of a 150 kV X-ray equipment specially for this type of work resulted in a reduction of the time required to under two days, with a marked improvement in the definition and resolution of the radiographs produced.

The equipment developed is described by Mr. F. W. WATERTON, A.M.I.E.E., in a paper which he read last week to the Institution of Electrical Engineers. Gas-turbine rotors presented a specially difficult problem because the source of radiation had to be placed in a central bore, of perhaps $1\frac{3}{4}$ in. diameter, in the rotor shaft. In the result an X-ray tube was constructed with its anode supported at the end of a jacketed tube some 43 in. long, and having an internal diameter of 1 in. The tube has a rated output of 150 kV peak, with 5 mA mean current. In its present design it is continuously evacuated.

Focusing

Although the use of more than one stage of acceleration is unusual for tubes operating at such a voltage it is found to offer special advantages in the present application. As the circuit diagram shows, three focusing lenses are used, with a final magnetic focusing coil. The optimum value of the voltages to be applied to the lenses was determined experimentally. However, it is not possible to obtain a converging beam of electrons from a system of this type, and so a magnetic focusing coil is included, placed just ahead of the pumping port of the tube, and giving the shortest practicable final electron path.

To give protection from the effects of stray fields, the final anode extension between coil and target is wrapped with an overlapping layer of 0·010 in. thick Mumetal tape. This is the more necessary because when the tube is in use the extension is surrounded by a complex steel structure which may have considerable residual magnetism. The vacuum envelope in the extension consists of a 1-in. bore copper pipe with $\frac{1}{16}$ in. wall thickness. Opposite the target this is bored out to 0·01 in. thickness to form an X-ray window. The tube is provided with a brass water-jacket.



Circuit diagram of supplies for 150 kV tube

The focal point size was found to be about 4 mm diameter with a focusing coil current of 110 mA. The X-ray output varies with focus, but after warming up and under normal conditions is 5·8 Rontgens/minute at 50 cm, measured on an open field without back-scatter. Tests with the tube have shown the lateral spread of the beam to give an arc of useful exposure over 150°, so that each weld can be radiographed in three exposures. The longitudinal spread of the beam is estimated at 60°.

Performance and Development

Comparisons show that a complete radiograph of one weld, using a 250 mg radium capsule, took three hours, while each of the three necessary X-ray exposures took seven minutes. The superior quality of the X-ray photographs is most noticeable.

At present the equipment requires a comparatively large space. It could be made smaller by using a sealed-off tube and a specially designed transformer. Development on a short time-rating basis also seems to offer possibilities. Another possible improvement is the fitting of a flat target to give a beam making an angle of 75-85° with the tube axis, and extending over an arc of 360°. In considering these modifications, it has to be remembered that the original instrument was built as an urgent matter for a specific application.

DISCUSSION

In the course of the discussion on the paper considerable attention was given to the general problems of industrial radiography. For instance, DR. A. NEMET (Philips Electrical) urged that the I.E.E. should take a more active part in bringing together users, manufacturers and persons interested in production techniques. He suggested joint meetings between the Institution and the Industrial Radiology Group of the Institute of Physics.

MR. C. CROXSON (Ministry of Supply) thought that the advantages of placing the source of radiation inside a tube being examined should be more widely known. He made various suggestions concerning the desired characteristics of suitable tubes. In conclusion, he said that the importance of the method could hardly be over-estimated. It combined economic advantages with a better radiograph.

MR. D. H. LUCAS (B.E.A. Research Laboratories) thought that the author had dealt a powerful blow on behalf of X-rays as compared with gamma rays. There appeared to be every incentive to carry on this development. He suggested a conical anode, point towards the cathode, as a means of giving "lighthouse"-type emissions.

North-Western I.E.E. Dinner

THERE were about 160 members and guests at the annual dinner of the Mersey and N. Wales Centre of the I.E.E., held at Liverpool on November 10. In proposing the toast "The Institution," Mr. J. B. Watt, managing director of Pilkington Bros., said that the electrical and glass industries had a common heritage in that Sir W. Siemens invented the regenerator furnace, the basic principles of which are incorporated in present-day furnaces. A further link between the two industries could be proved by the fact that the present chairman of the Mersey and N. W. Centre, Mr. W. A. Hatch, was the third member of Pilkingtons to hold this position.

Development and Research

Mr. Watt called for greater efforts in development and research in industry. A recent F.B.I. report showed that the light electrical engineering group spent more on research than any other group, while heavy electrical engineering occupied third place in the list. But by U.S.A. standards we had a long way to go. While no comparable figures for industrial development were given, the U.S.A. spent seven times more on research in universities. Great Britain needed men of judgment, vision and initiative. He believed we had such men.

In reply, Col. B. H. Leeson, O.B.E., T.D., President of the Institution spoke of the development of the last 50 years in the electrical industry, and how that development had contributed to our present high standard of health and living. Today in the electrical industry we had on the one side nationalisation, and on the other private enterprise, represented by the manufacturers. Although two different kinds of organisation, the link between them was strong. The President continued by stating that the return to full prosperity of this country was held back by the electrical industry being in the strait-jacket of lack of men, money and materials. The factories were not working to full scope. These facts represented a challenge to the basic industries of coal and steel, which must produce more. In addition we must save more and plough back our profits. If we could do this, Col. Leeson gave as his opinion that there were three classes of projects. Firstly, what he termed as "overdue"—education lacking due to insufficient money; railway electrification, etc. Secondly, "foreseeable"—atomic projects; and lastly, "exploratory"—heat and power which were hidden in Nature and not yet looked for.

Concluding, the president suggested that the Coronation year should be taken as a starting-point for increased effort. Already the electrical industry, on the manufacturing side, was the third largest exporting industry of the country, one-third of these products being shipped overseas. Furthermore, £10,000,000 is being spent on research. "With the strength of the Institution being in the Centres and the individual, it is important that we create resources and not squander them."

"Our Guests" was proposed by Mr. J. Eccles, C.B.E., B.SC. He congratulated Mr. W. H. Green on reaching 50 years as assistant hon. secretary to the N. West Centre of the I.E.E. The Lord Mayor of Liverpool, Alderman A. Morrow, J.P., replied, calling for yet further efforts in the lighting of our cities.

CIRCUIT-BREAKER DEVELOPMENTS

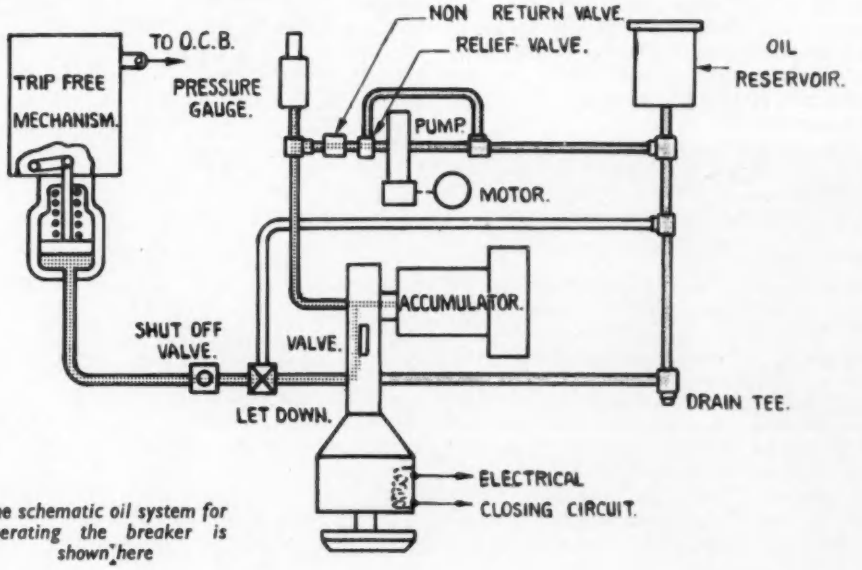
A Pneumo-hydraulic stored energy system of operation

AN ingenious switchgear reclosing mechanism developed by the Brush Electrical Engineering Co., Ltd., was recently demonstrated at Loughborough. This was designed primarily to give four circuit-breaker closing operations through the motive power of stored energy even in the event of all external power failing with the exception of the low voltage operating circuits.

The heart of the equipment is the high pressure accumulator, which uses a pneumo-hydraulic stored energy device of a type which has been employed for many years for impulse starting of heavy diesel engines. The accumulator itself consists of a small steel container, fitted with a Neoprene bag. This bag is filled with air compressed to about 2,000 lb/sq in. and positively sealed. As there can be no leakage and the air is not consumed, no recharging is necessary. With air only in the accumulator, the bag fits snugly into the steel body. To "charge" the accumulator, oil is pumped into the space between the bottom of the bag and the steel body, and this process is continued until the air in the bag is compressed up to 4,000 lb/sq in. As the oil and air pressures are balanced, the diaphragm is not subjected to any strain. Under these circumstances sufficient stored energy is available for four successive circuit-breaker closing operations without the need for any futher pumping of oil.

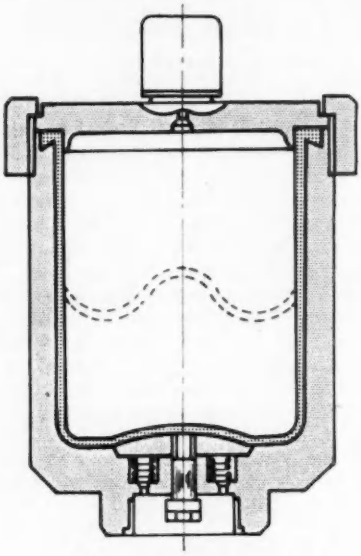
The Valve System

Screwed to the accumulator outlet is the valve system. In the non-operating position the h.p. oil is restricted to the pump line, the valve body up to the seating and the accumulator, and the operating cylinder which con-



The schematic oil system for operating the breaker is shown here

tains the actuating piston is held in communication with the oil reservoir which is at atmospheric pressure. Upon energising the closing solenoid, the operating cylinder is cut



Sectional view of accumulator

off from the reservoir, and put into communication with the h.p. oil in the accumulator. A small ball valve system, included in the main valve plunger, permits a preliminary leakage of h.p. oil to take place before the main valve opens, thus preventing hydraulic shock or hammer of the working parts. De-energising the solenoid reverses the action and the pressure oil in the operating cylinder flows back into the reservoir.

The solenoid push rod is connected to a sealing switch to ensure that the solenoid itself remains energised until the circuit-breaker has completed its closing movement.

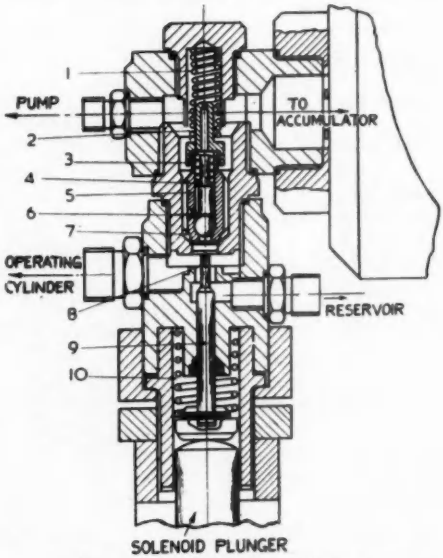
Operation

A standard fuel injection pump, as used on diesel engines, pumps oil from the reservoir to the accumulator. This pump is motor driven, a pressure switch starting it when the accumulator pressure falls below a predetermined value and stopping it when pressure is restored. As an emergency precaution a relief valve is connected to the h.p. side of the pump, and oil can be bypassed back into the reservoir line. A further cut-out switch interrupts the control valve solenoid circuit if the accumulator pressure falls too low for a satisfactory closing operation.

Owing to the negligible leakage from the accumulator system, once it is up to pressure the ¼ h.p. induction motor will not normally run until the circuit-breaker is operated. To recharge after one operation only takes about 30 seconds. Under emergency conditions, hand cranking can be employed to recharge the accumulator. It is, however, felt that with sufficient stored energy for four closing operations it is unlikely that this will need to be employed.

For supervisory or remote control a 30 volt tripping battery is sufficient to close the circuit-breaker, consumption being about 120 watt-seconds per operation, and the device can be applied to any normal trip-free circuit-breaker operating mechanism.

The mechanism as demonstrated was fitted in the cubicle of a 33/38.5 kV outdoor oil circuit-breaker type OR 38. This particular breaker has a short circuit rating of 75 MVA and with a normal current rating of 1,000 amps, which allows a temperature rise at the hottest point well within that permitted by B.S. 116. The operating mechanism is normally fitted with either a solenoid or spring closing device with provision for motor rewinding, and is enclosed in a weatherproof sheet steel kiosk which also houses the auxiliary equipment and local operation controllers. When the hydropneumatic system is used, the equipment is fitted in addition and is as shown in the picture at the beginning of this article.



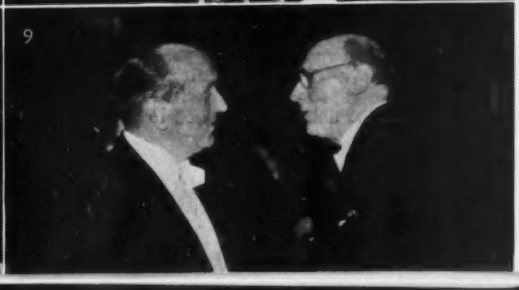
Cross-section of valve mechanism

ELECTRICAL INDUSTRIES BALL—1952

Grosvenor House, London
Friday, November 14

★ ★ ★

1. Dame Caroline chats with Sir John Hacking and Mr. H. F. Carpenter.
2. Mr. J. D. Peattie and Col. Lapper with the ladies.
3. Sir John Dalton with Mesdames Wardrop and Wayne.
4. Mr. H. M. Drake (president) and Mrs. Drake together with Mr. Fothergill (secretary) superintend the raffle.
5. Lord Colwyn and his wife (Miss Hoare) with Messrs. Bowen and Fothergill and Miss McCormick.
6. Col. Wilfred Lapper, Sir John Hacking and Lord Citrine.
7. Business or pleasure? Messrs. H. C. Wells, T. W. Wilcox and S. Eclair-Heath in conference.
8. Mr. E. R. Wilkinson listens to a past-president, Mr. C. R. King.
9. Mr. R. A. S. Thwaites considers a point from Mr. Briggs.



overseas news

A Steam Power Plan

American interests are planning to spend almost $2,000 million to finance a chain of Canadian steam power plants to provide power for the United States, it is reported. The project will use low-cost coal of South-western Alberta and will send its electricity into the north-west power pool to Hungry Horse and Libby, Mont., apparently. A Los Angeles consulting engineer has said that assurances had been received from the Canadian government that up to 10,000,000 kWh could be generated, using Alberta's many streams and coal deposits. He said 100 units in all are planned, and they will be built at the rate of two or three per year, chiefly along a strip of land 35 miles wide and 125 miles in length along the Alberta-British Columbia boundary.

New Plant

At a large new plant just opened in Scarborough, Toronto, for the Frigidaire Products of Canada, more than 1,000 appliances and other products can be manufactured each day. A number of formerly imported products are to be made for the first time in Canada by the company. The plant is now making electric refrigerators, cookers, beverage coolers, ice-cream cabinets, food freezers and air conditioning equipment and other products. Several General Motors products, including water heaters, automatic washing machines and clothes driers will be made in Canada for the first time. The factory has a floor space totalling 10 acres, and cost $11 million to erect and equip. One of the most modern factories of its kind in the world, it includes a $1 million porcelain finishing department and 4½ miles of conveyor systems.

Records in B.C.

The month of August was a record one in several respects for the British Columbia Power Commission. The Commission's John Hart development on the Campbell River, Vancouver Island, generated its highest output (36·4 million kWh) since coming into operation in December, 1947. Also during the month a 24-hour output of 1,175,484 kWh and maximum demand of 83,000 h.p. established record figures. The Commission points out that the increased output is largely due to demands other than those of the two major industries supplied in the area.

Dispute with Union

In an unusual case in Canada recently, an arbitration board ruled that the United Electrical Workers' Union had violated the no-strike clause in its contract with the Canadian General Electric Co. by failing to take appropriate action to stop strikes. The union was ordered to pay the company damages of $9,200 for losses incurred by an outbreak of strikes at its Davenport plant. But now the union is refusing to pay the award, maintaining that the arbitration board exceeded its jurisdiction. So the company has stated it proposes to withhold the dues collected for the union (about $500 a week) until the amount is paid off. But that move the union now declares would be "an illegal seizure of employees' wages," and has threatened to take whatever steps are necessary to counter it.

N.S.W. Expenditure

The Electricity Commission of New South Wales has been allocated £13,500,000 for the current financial year, the Premier, Mr. J. S. Cahill, stated in Parliament a few days ago. This amount, which compares with an expenditure exceeding £15 million last year, would be spent on the new power stations at Pyrmont, Tallawarra and Wallerawang, and on extending the capacity of Bunnerong. Additional power would be available through 16 package generating sets and 31 diesel units. The package units were being used in groups of four at Port Kembla, Penrith, Maitland and Liverpool. The diesel units were being installed in groups at Canberra, and at Newcastle, Kempsey, Parkes, Maitland and Liverpool, as well as in the metropolitan area. Power, which would be added to the inter-connected system by the sets, totalled 113,000 kW.

Compensation Claims

Claims on the State Electricity Commission for Western Australia for £97,200 will be made by the Bassendean Road Board and for £48,700 by the Guildford Municipal Council for their electricity undertakings. Those undertakings were compulsorily acquired by the Commission on June 1, 1951. Members of the local authorities affected have shown concern at the lack of progress being made in reaching an agreement with the Commission, it is stated. Other local authorities, the undertakings of which were compulsorily acquired between June 1 and July 31, 1951, are Claremont, Subiaco, Nedlands, South Perth and North Fremantle. The seven bodies, which serve about 18,000 consumers, have yet to reach agreement with the Commission for a reimbursement price. It is believed that the total claim will be about £700,000.

Fuel Problem in South Australia

The South Australian Mines Department had reported there was sufficient coal at Moorlands to establish a regional power station, the Premier, Mr. Playford, said in the Assembly recently. The Electricity Trust, however, felt there were greater advantages to be got by continuing development of Leigh Creek coalfield and the

Port Augusta regional power station. It was proposed to continue investigations into types of mining methods, machinery and surveys at Moorlands with the idea of its eventual inclusion in the general system of electrification.

Development in Finland

Finland's latest hydro-electric power station building programme is designed to give the country a total electricity output of 6,485 million kWh a year by 1956. Present hydro-electric output is 4,625 million kWh a year. The principal stations to be constructed under the programme are Jumisko (100 million kWh a year), Monttakoski (210 million), Pamilo (230 million), Utakoski (270 million) and Petaejaeskoski (400 million). Work on the first three named stations is well advanced and they are expected to be operating at the end of 1954. Utakoski and Petaejaeskoski stations will be finished by 1956. Another phase of the development programme is the extension of a number of existing stations, such as Tainionkoski, Imatra, Kuusankoski and Mankala. Meanwhile, a number of power stations begun under an earlier programme will be ready for operation next year. The main ones are : Paelli (275 million kWh per year) and Noujua (465 million kWh per year). In Finland the annual output from hydro-electric stations has increased from 2,500 million kWh in 1944, to 4,550 million in 1951, and an estimated 4,625 million in the present year. Besides the development of hydro-electric power, Finland also plans to double her output of steam-generated electric power by 1956. Output would then be 800 million kWh.

Pykara Extension

In Madras, work is proceeding apace on extensions to the Pykara hydro-electric station, involving the installation of two 13,600 kW generating sets, together with associated transformers, switchgear, etc. This extension also includes the provision of another penstock line and the construction of a reservoir with a capacity of 2,000 million cu ft on the Pykara river. It is expected that the extension will be completed about the middle of next year.

Standard Voltages

A Draft Indian Standard for recommended voltages and frequency, recently formulated by the Electrical Plant and Switchgear Sectional Committee of the Indian Standards Institution, recommends preferred voltages for future installations and permissible voltages to cover the existing systems. For d.c. systems the preferred voltages are 115, 230 and 460. For a.c. systems below 1 kV they are 240 V 5 ph. and 415 V 3 ph. Above 1 kV the nominal voltages suggested are 3·3 kV, 11 kV, 22 kV, 33 kV, 66 kV, 132 kV, 264 kV and 275 kV, the last two being tentative, to be confirmed in the light of experience gained in other countries. It further recommends 50 c/s as the standard frequency for a.c. systems. This proposal to standardise voltages in India is considered of great importance in view of the far-reaching plans for electricity development.

Mysore Needs Aid

The Chief Minister of Mysore has asked the Central Government to grant financial aid to the state to the extent of 200 million rupees, in order to complete the Lakavalli combined irrigation and hydro-electric scheme, on which Mysore has already spent about 10 million rupees.

Israel's Works Closed

The Philips electric light bulb manufacturing works in Nathanya, Israel, have been closed down, we understand. The reason for the closure is given as failure to obtain regular foreign currency allocations for the purchase of raw materials. The plant, which had faced growing demands for its products by local customers, was closed by its manager, Mr. J. Schellekes, on orders from Holland. Transfer of the factory's machinery from Israel is contemplated, it is stated.

The Fuel and Power Situation

The future supply of fuel and power in New Zealand is to be investigated by a committee consisting of representatives of electric power boards, gas companies, the State Hydro-Electric Department and the Department of Industries and Commerce. This was announced in the N.Z. House of Representatives recently by Mr. Watts, Minister of Industries and Commerce, during discussion on the Electric Power Boards' Amendment Bill. This Bill authorises power boards and owners of gasworks to make agreements for the acquisition of gasworks by the boards. Its prime purpose, we gather, is to ensure that the gas industry, although losing money heavily, should not be allowed to die—at least, not yet, while the Electricity Supply Industry is unable to meet all demands. In the discussion Mr. Goosman, Minister in charge of the State Hydro-Electric Department, agreed that it was essential that the gas industry should be kept going. It now produces about 26% of the heat and power in New Zealand, he said.

Electrification Awaited

Wellington, New Zealand, is looking forward to 1954, when all its railway lines will be electrified. It is expected that electric trains will begin running on part of the line in the latter half of next year. The abolition of steam engines on Wellington's railway system will result from the £4,500,000 Hutt Valley electrification scheme, which will also add over 20 miles of electrified railway already in use from the city to Johnsonville and to Paekakariki. The electrification scheme, which will operate at 1,500 V d.c., provides for the construction of four substations, one of which has been finished. With completion of the project a daily service of about 250 trains is envisaged.

PERSONALITIES

IN THE INDUSTRY

Until recently manager of the British Thomson-Houston Co.'s Swansea district office, **Mr. S. J. Clarke,** T.D., has been appointed manager of the company's Newcastle-on-Tyne district office, in succession to **Mr. F. C. Barford** who will shortly be taking up another position in the B.T.H. Co. Mr. Clarke was educated in Hong Kong where he served an apprenticeship with the Hong Kong Electricity Co. Coming to England in 1930, he became a graduate apprentice with B.T.H., and in 1933 went to the Swansea district as power engineer. After war service he returned to that office and in June 1948 was appointed manager there. As previously announced, Mr. Clarke is succeeded at Swansea by **Mr. K. M. Fox.**

Mr. S. J. Clarke

Mr. L. W. Postle, A.M.I.E.E., Eastern Counties area manager for the Electrical Apparatus Co., Ltd., has been appointed to the managership of the company's Birmingham office. He has been with the company for fifteen years. His position at Ipswich will be taken over by **Mr. P. J. Murray** of the E.A.C. London sales organisation.

Mr. Raymond Hurley, chairman of the Thor Corporation, of Chicago, is at present in this country to survey the current market conditions and to visit the British concern, Thor Appliances.

Mr. H. R. Cooper, M.I.E.E., recently relinquished his position as managing director of International General Electric Co. (India) Ltd., after 28 years' service in India, and has joined the board of International General Electric Co. of New York Ltd., London. **Mr. W. M. Portrude** has succeeded Mr. Cooper as managing director of the Indian organisation.

Mr. M. B. Mallet has been appointed general manager and chief engineer of English Electric Co. of Canada, Ltd. He succeeds **Mr. A. H. Frampton** who has resigned as vice-president and general manager. Mr. Mallet joined the company in 1941 and has been chief engineer since 1948.

Mr. H. Sayers, of Birkenhead, has been appointed lecturer in electrical engineering at Rutherford College of Technology, Newcastle-upon-Tyne.

At the annual conference of the Electrical Supply Authority Engineers' Institute of New Zealand, **Mr. R. S. Maunder,** M.I.E.E., of the Wellington City Council electricity undertaking, was elected president.

It is not generally known that **Mr. Reginald Cox,** who is a director of the Yorkshire Switchgear & Engineering Co., Ltd., and London Manager of the Electro Mechanical Manufacturing Co., Ltd., is a Freeman of the City of London, and was recently made a Liveryman of the Worshipful Company of Tallow Chandlers. On this rather unusual honour we offer Mr. Cox our congratulations.

Mr. Reginald Cox

Formerly sales manager of the Ceramic Resistor Department of the Morgan Crucible Co., Ltd., **Mr. R. H. Wilson,** ASSOC.I.E.E., has joined A.B. Metal Products, Ltd., in the capacity of general manager.

Mr. W. C. Gomersall, M.I.E.E., chairman and managing director of the China Engineers, Ltd.; the China Printing & Finishing Co., Ltd., and the Shanghai Worsted Mill, Ltd., is due to arrive in this country from Shanghai, Hongkong and Singapore towards the end of December. The China Engineers Ltd. are agents for Johnson & Phillips Ltd. in Shanghai, Hongkong and Singapore and represent a number of other prominent British manufacturers. It is their intention to continue to maintain their offices in Shanghai and any British manufacturers who have been interested or who are still interested in trading with China are invited to communicate with Mr. Gomersall, at Malincourt, Copsem Lane, Oxshott, Surrey.

At the Association of Electrical Machinery Trades' annual dinner, reported last week: Mr. J. A. Hardy (chairman of the A.E.M.T.) is seen receiving Mr. A. L. Johnson, the principal guest

Newly appointed secretary of the Electrical Wholesalers Federation is **Mr. H. F. Wickham,** who has been a member of the headquarters staff of the Federation since 1948. By this appointment, **Mr. A. B. Wildsmith** is now nominated as director of the Federation, and the duties of secretary which he also undertook have been placed upon Mr. Wickham. The latter has always been connected with the wholesale distribution side of industry, first with the clothing trade, and after the war when he joined the staff of a prominent E.W.F. member.

Mr. H. F. Wickham

The presentation to **Mr. H. J. Devaney,** A.M.I.E.E., shift charge engineer, of a Westminster chiming clock recently took place in the Board Room of Nechells "B" power station, Midlands Division, B.E.A., by **Mr. G. D. Clegg,** A.M.I.E.E., station superintendent, on behalf of his colleagues at "A" and "B" stations. John Devaney entered the industry in October 1932 with the City of Birmingham Electric Supply Department as a substation attendant, was transferred to the Generation Department in 1939, and has now taken up duties as assistant boiler house superintendent at Battersea power station, London Division.

M. Michel Stevenin, deputy station superintendent at St. Ouen power station, Paris, recently visited the North Western Division, where after being conducted around various power stations including Agecroft and the Trafford gas turbine installation, he visited the Manchester Control Room at Didsbury. Later, at the invitation of **Mr. A. R. Cooper,** Controller, M. Stevenin discussed matters of mutual interest with several officers at Divisional Headquarters.

M. Stevenin sees the Trafford gas turbine set

OBITUARY

Mr. W. E. French, M.I.E.E., who retired in 1946 from the position of head of the Electrical Engineering Department at Leeds University, died last week. He was associated with that department for 38 years, and was a past chairman of the North Midland centre of the I.E.E.

There will be sincere regret throughout the electrical industry at the news of the death on November 12, of **Mr. Sydney Bryan Donkin,** M.Inst.C.E., M.I.Mech.E., M.I.E.E., at the age of 81. Senior partner in the firm of Kennedy & Donkin, consulting engineers, he was another of those well-known engineers who played such a prominent part in the development of the supply industry. It was in 1908 that he became a partner with Sir A. B. W. Kennedy and in 1913 the style of the firm was changed to Kennedy and Donkin. He advised on the design and construction of generating stations, transmission and distribution systems, and was associated with work on several of the grid schemes for the C.E.B. He was one of the three engineers appointed in 1943 to re-examine the question of the Severn Barrage, and also made many reports on district heating schemes. He was one of the panel of advisers to the North of Scotland Hydro-Electric Board, and a member of the Egyptian Hydro-Electric Power Board. He has also been prominently associated with many organisations in the industry, notably as chairman of the Association of Consulting Engineers in 1927-28, and 1943-44, president of the A.S.E.E. in 1928-31, and of the Institution of Civil Engineers in 1937-38. In addition he served on numerous technical committees. A memorial service is to be held at St. Margaret's, Westminster, next Thursday, November 27, at 12 noon.

Mr. S. B. Donkin

Mr. Geoffrey M. Gullick, C.B.E., chief mechanical adviser to the Ministry of Fuel and Power during the last war, died on Nov. 11, aged 63. Earlier he was a director of Mavor and Coulson.

Mr. A. M. Wilson, director of Clyde Blowers Ltd., died on November 9.

Mr. E. Barnes, general manager and engineer and also a director of the Manx Electric Railway Co., Ltd., died on November 1.

The death occurred recently of **Mr. L. V. Lurring,** who retired only a few weeks ago from the position of station superintendent at Dolgarrog hydro-electric station of the Merseyside and N. Wales Division, B.E.A.

Mr. S. W. Melsom, M.I.E.E., formerly technical officer to the Cable Makers' Association, died on November 15, aged 73.

SELLING ABROAD

AMONG many and varied subjects discussed at the British Institute of Management Conference at Harrogate last week problems of overseas selling were considered by Mr. A. Law (Babcock and Wilcox), who stated that currency restrictions were limiting our ability to keep abreast with Continental competitors. Foreign countries, especially Latin America, insisted on payment in local currency, and, whereas Continental countries were prepared to accept this the Treasury insisted that British manufacturers should accept only sterling.

Sales Promotion

Earlier, Mr. Law had outlined the history of his company, showing how it had outgrown its American parent to capture markets throughout the world. Methods used to effect and promote sales were shown to be invariable, despite the stage to which the company's representation in that country had reached. The first need was the establishment of an intelligence service, cognisant of potential development, backed by an awareness of users' problems. Sales promotion benefited materially from direct contact with the buyer. frequent visits of senior executives on good-will missions, continuous publicity and sales conferences.

Financial Prospects

Of other topics discussed at the conference, finance was naturally well to the fore, indicated by a paper on the Finance of Industrial Enterprise presented by Mr. J. L. Northcott. Discussing the banks' contribution to National solvency, he gave an historical outline of the Treasury directive on bank advances which indicated the control, both physically and monetary, which had been applied to British industry since 1939. How effective that control had been was shown by the fact that advances had more than doubled since 1946, although, following this year's increase in the bank rate, they had fallen significantly by £200 million. Mr. Northcott saw in the now complementary physical and monetary controls a better prospect for ultimate solvency and equilibrium than at any time since the war.

THE VOICE OF EXPERIENCE

OVER two years ago the Electrical Association for Women sent out to their members and to others a form of questionnaire concerning the various electrical aids to housecraft and asked for candid opinions from experienced users on the quality and efficiency of these appliances.

Now, after two years' hard work collating the wealth of information which has been gathered in, the Association has published the results of this survey in a booklet under the title "Towards Perfection."

This survey will without doubt be of great value to the manufacturer because it represents two years' impartial and voluntary market research. Collated by Mrs. E. Elmitt Edwards, the report concerns the performance of ten thousand and seventy-six domestic electrical appliances. It shows that there exists a great measure of satisfaction with existing appliances—a sure tribute to the manufacturers and affords evidence of many practical improvements which are more apparent to the housewife in the constant use of her appliances, than to the designer in his office. The report deals with each appliance in a chapter of its own. It shows clearly that, whilst these many improvements are suggested, housewives are quite aware of the additional cost entailed, which, in the main, they are not prepared to meet, and thus presents a challenge to manufacturers to incorporate new technical developments and the use of new materials in an endeavour to improve without raising the cost.

The report reveals concern on the part of the users for the provision of appliances which ensure the safety of the young and old by adequately protected equipment, and also the housewife against the purchase of shoddy appliances and accessories.

Whilst standardisation is welcomed for easy replacement, stress is laid on the design of equipment in perhaps two or three different sizes of equipment to suit the many sizes of housewives using this equipment.

A growing realisation by the housewives of what the engineer and designer have to offer her is most apparent, and it will be seen from the report that in choosing apparatus the housewife is influenced by many considerations which would not have affected her choice prior to the war. Sound appears to have great effect on the choice of housewives, and quieter equipment and the fitting of suppressors to all appliances causing interference with radio and TV programmes is called for. Colour also is important, but, although many suggestions were received for many pastel coloured alternatives, housewives generally were quite pleased with the now standard white and cream shades. The report contains many suggestions concerning amendments and new appliances to meet special requirements. Many of these appear to have been already produced, but it will prove worth while to the manufacturer and the dealer to heed the valuable suggestions to be found in this report.

Line Erection at night

B.E.A. Brunswick Wharf and Brimsdown 132kV line encounters an unusual obstacle

NOW nearing completion is the B.E.A.'s new 132 kV line running from Brunswick Wharf to Brimsdown through the heart of East London. This double-circuit line which is being built by the J. L. Eve Construction Co. is being strung with six primary conductors of the 0·4 sq in. grease-impregnated s.c.a. type, and at one point crosses the main Eastern Region B.R. tracks at Stratford. At the crossing point there are nine tracks, five of which are on the 1,500 V d.c. overhead system, and the traffic is one of the busiest sections of railway in the world with a traffic density of 900 trains per day.

In stringing the lines, it was, therefore, essential to minimise dislocation of the railway services, despite the fact that the electrified system would have to be made dead. Arrangements were accordingly made with the Railway Executive who substituted steam trains for certain passenger trains during the night so that work could proceed from about 12.45 a.m. to 4.15 a.m. On this basis and by detailed organisation of the work it was found possible to erect and sag two primary conductors on each of three successive nights, and the earth wire during a shorter period on the fourth night.

To enable the work to be carried out in darkness, floodlights were installed above both towers on specially erected scaffolding, and floodlighting was also provided throughout the intervening 990 ft span.

The actual sagging operation was carried out by extinguishing all the above lighting, and floodlighting the sagging board only, the position of the conductor being determined by means of two red lights which were attached to it before erection at the calculated position of maximum sag. Observation of these special lights during sagging was made by means of a telescopic gunsight suitably attached to the sighting tower, and trained on the sagging board on the other tower.

The stringing was carried out without incident during the nights of September 23 to 26, 1952, inclusive, and although some 50 steam trains passed by each night during the working period, none was delayed by more than a few minutes. Acknowledgments are made to Mr. H. V. Pugh, M.I.E.E., M.I.Mech.E., Controller of the London Division B.E.A., for the information given in this article.

The line crossing E.R. Liverpool St. main line at Stratford

The BUYER'S *Column*

G.E.C. 10-in. Oscillating Fan

THE popularity of the 8 in. rubber-bladed fan recently introduced by the GENERAL ELECTRIC CO. LTD., Magnet House, Kingsway, W.C.2, has prompted the company to introduce a larger 10 in. oscillating model.

In appearance the new model closely follows the lines of the 8 in. model. It incorporates a robust oscillating mechanism incorporated completely inside the motor body. A patent slipping-clutch is also fitted which safeguards the motor and mechanism in the case of the arc of oscillation being obstructed.

When used as a bracket fan, this device permits the selection of any 90 degree arc of oscillation out of the total 180 degrees available. It is only necessary to "focus" the air stream by turning the

G.E.C.'s 10-in. fan as a wall-mounted model

motor body, when the oscillation continues around the selected point. Power unit is a totally enclosed, shaded pole induction motor fitted with oil-retaining bronze bearings.

Air displacement from this rubber-bladed fan is 900 cu ft, current consumption is 30 watts, weight is 5½ lb., and the fan, finished in silver grey with black blades and controlled with an on/off push-button switch, costs £7 18s. plus purchase tax.

Unity Addheaters

NEW development in electric heating with many points in favour is the "Addheater," a new form for the conventional tubular heater now being produced by UNITY HEATING, LTD., Chilworth Manor, near Southampton.

These heaters are made of moulded non-metallic sheeting which is ribbed and surfaced to provide a rapid dissipation of heat, to ensure that a heater does not feel excessively hot on contact. The special elements operate below red heat.

Addheaters are built up in sections and can be joined together into long sections up to a maximum of 15 amps (e.g., twelve No. 2303 heaters could be joined together to make a length of 36 ft, a simple busbar being available for electrical connections of two or more heaters).

Finished in natural brown or in dove grey or cream as an extra at 1s. 2d. per foot. The Addheaters are available in the following models:

		Price (including tax)	*Loading*	*Weight*
2301	1 ft x 6 in.	£1 9s. 6d.	80 W	¾ lb.
2302	2 ft x 6 in.	£1 14s. 9d.	160 W	1½ lb.
2303	3 ft x 6 in.	£1 19s. 11d.	250 W	2¼ lb.
2311	1 ft x 1 ft	£2 19s. 0d.	160 W	1½ lb.
2312	2 ft x 1 ft	£3 9s. 5d.	320 W	3½ lb.
2313	3 ft x 1 ft	£3 19s. 10d.	500 W	4¾ lb.

The Angel Runabout Truck

REPLACING the "Angelectruc" truck which has been manufactured over the last five years by the ANGEL TRUCK CO. LTD., 215-219 Albion Road, Stoke Newington, N.16, is the company's latest "Runabout" truck.

This new Model 1412 now enables the operator to sit on the truck instead of walking in front as on previous "Angel" models, preventing accidental injuries to the operator.

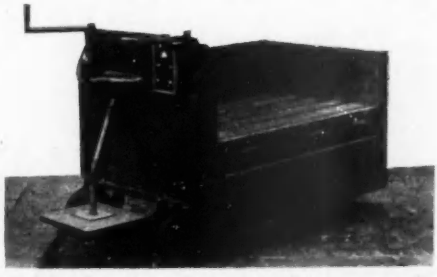
It has a new system of steering combined with a starting press switch after the style of a "dead-man's" handle, whilst a separate lever on the opposite side operates the brake with parking device.

The control board has now been placed at the height of the operator's hand so that the reversing operation or change of speed can easily be effected.

Powered by Exide Ironclad 24 V batteries with a capacity of 99 a.h. driving a ¾ h.p. compound motor of well-known make, the truck at a speed of 4 m.p.h. has a range of 12 miles. There are two speeds controlled by a modification of the shunt winding providing field weakening.

These are chosen for convenience, the low speed for works operation and the higher speed for use in main gangways, etc. The towing attachment enables the user to couple on a trailer.

Any type of superstructure can be supplied, the standard models having platform sizes as follows:



The Angel runabout is an essential in any works

No. 1412, 53 in. x 36 in.; No. 1413, 60 in. x 39 in.; No. 1414, 66 in. x 12 in. Salient points of the 1412 described fitted with box arrangement: overall length, 81 in.; overall width, 36 in.; platform 22½ in. high from ground and fitted with six half round trays to ease loading and unloading.

Although designed to have a capacity of 10-15 cwt, the Model 1412 runabout under test carried a load of one ton plus two men without effort.

Attractive Dexray Fires

TWO new stylish heating units which will be warmly welcomed at the present time have been released by Dexray Engineering Co. Ltd. through their agents, BARRIES ELECTRICAL AGENCIES LTD., King Street, Brighton 1.

The R.10 which we have illustrated comprises a double-wing deep parabolic chromium reflector with long fire bars which are guarded by heavy guard bars or by a close-mesh chromium plated metal tape screen, whilst the surround is an attractive wrought iron scroll work, indeed graceful in appearance and efficient in operation. This model is priced £6 5s. (to which tax must be added). It is finished in cream or cream and gold and may be supplied as a vertical or horizontal model loading 2 kW.

The second model is the R.15, a wall-fitting model which may stand on the floor by rearrangement of the swivel bracket. Both reflector and

This graceful Dexray fire has two elements, in separate reflectors

tape screen are finished in chromium plate; the body is cream and black stove enamelled. A cord switch is fitted on an adjustable bracket. Rated at 1 kW, the R.15 costs £3 10s. (not including purchase tax).

Multicore Make Silver Solder

WITH the co-operation of Johnson Matthey of Hatton Garden, Ersin Multicore solder is now available in Comsol alloy. This tin/lead/silver solder has a melting point of nearly 300° C., which is 113° C. above the melting of the usual tin/lead alloys.

Ersin Multicore Comsol solder is normally supplied by MULTICORE SOLDERS LTD., Maylands Avenue, Hemel Hempstead, Herts, in 16 s.w.g. and is intended for soldering processes where components are likely to be subjected to excessive working temperatures. Projector lamps, some types of electric motors, etc., are examples. It is believed that Comsol may also be suitable for use on radio and electrical equipment being subjected to sub-zero temperatures, although research into this is at present still proceeding.

Generally, this new product will be supplied direct to manufacturers, the price being slightly less than that charged for Ersin Multicore 60/40 alloy.

ASEA Water-tight Pendant Switches

AN all-rubber-covered hoseproof, watertight pendant push-button switch is now marketed by ASEA ELECTRIC LTD., London E.17. This switch meets the need for a robust pendant controller for hoist blocks, cranes, etc., operating out-of-doors or in wet or corrosive conditions.

The main body of the switch is moulded entirely of rubber except for an inset metal ring for fixing to the handle; this carries the buttons in an aluminium frame which is also covered with a thick layer of moulded rubber. The switch mechanism is sealed behind a flexible rubber diaphragm. Single-motor or two-motor reversing switches are available with double pole contacts able to handle the full current of squirrel cage motors up to 2 h.p. on 400 V, 3-phase supply or contactor coils of the largest size.

TRADE PUBLICATIONS

VENTILATING.—Sturtevant Engineering Co. Ltd., Southern House, Cannon Street, London E.C.4, have just issued a revised brochure No. 3702 on "Positive Ventilation." It supersedes No. 3701.

CABLE CONNECTORS.—The range of e.h.t. concentric connectors which are made by The Plessey Co., Ltd., Ilford, Essex, is now described in a brochure just published by the company.

The WEEK in NEWS

Australia eases Import Ban

QUOTA DEBITS WAIVED AS FROM JANUARY 1

ENCOURAGING news for U.K. exporters of electrical goods to Australia is contained in an announcement by Senator Neil O'Sullivan, the Australian Minister for Trade and Customs, which eases restrictions on imports from non-dollar and non-Japanese areas as from the New Year. The direct effect is certainly welcome, but its implication, namely, that Australia means to relax the restrictions as soon as her economic position permits, is even more welcome. An assurance to this effect was, in fact, given by Mr. Menzies a few days earlier, and repeated by Senator O'Sullivan.

The relaxation cancels all debits to importers' quotas established for imports of non-dollar or non-Japanese origin as from January 1. Importers will now be able to apply for licences up to the full value of their established quotas during the first quarter of 1953. When the restrictions were imposed in March there were many goods on their way by sea—sufficient to fill importers' quotas for many months. Quotas were consequently fully mortgaged and no further orders could be placed.

Latest information from the Commonwealth is of steady progress in the restoration of her balance of payments. Last month she had favourable trade balance of £32 million compared with a deficit of £43,200,000 in October, 1951. During the past four months Australian exports have exceeded imports by about £50 million. Prior to the March ban total imports from this country amounted to over £100 million a year, of which electrical consumer goods were valued at about £11 million. Senator O'Sullivan commented that the effect of the concession in terms of imports and increased availability of consumer goods would probably be felt about the middle of next year. In some lines of goods, stocks are still quite high, but at least one report mentions that domestic electrical apparatus is in particularly strong demand.

American Literature on Electronics Available

COMMERCIAL Relations and Exports Department of the B.o.T. has secured a directory of exhibits as well as numerous copies of trade literature from a representative cross-section of American firms who exhibited at the National Electronics Conference held in Chicago earlier this year. The literature available is a comprehensive collection and can be borrowed by interested U.K. manufacturers for periods up to 10 days. Applications will be dealt with as received and should be made to the B.O.T. at (Room 7172), Horse Guards Ave., London S.W.1.

B.E.A. BORROWING UP TO £75 MILLION

A FURTHER statement of guarantee in respect of loans proposed to be raised by the B.E.A. has been issued. It was given by the Treasury on October 30 and replaces that announced on September 2 last. The guarantee amounts to a sum not exceeding £75 million and relates to the B.E.A.'s temporary borrowings from the Clearing Banks and Scottish Banks or other persons up to the end of 1952. The previous amount involved was £55 m.

Radio and TV Sales continue to Rise

THE coming of winter brought about the usual seasonal increase in the sale of radio and television sets during September. Sales have been rising steadily during the past few months, although they still fall short of the figures in the corresponding months in 1951. According to the latest R.T.R.A. index, the average number of radio sets sold per shop rose from 5·63 in August to 6·85 in September. Sales in September, 1951, were 10·17. As regards TV sets, sales in the month under review rose by 4·99 to 10·28. September, 1951, figure was 8·82.

The First Half-Century

A Bill to amend the Electric Lighting Act, 1882, and the Electric Lighting (Scotland) Act, 1890, sounds rather startling, but there is nothing to get excited about. The Bill is merely a minor amendment to enable Dundee to leave the gasworks capital out of account when raising money for electrical purposes. Dundee has borrowed a lot for the gas department, and if the electric light borrowing powers be not allowed to stand on their own legs no more capital can be raised for extensions. Hence the present little Bill, which has the Lord-Advocate for its sponsor.—*From our issue of November* 20, 1902.

NEW WAGE RATES FOR CONTRACTING INDUSTRY

Age	Males under 21 Category II			Apprenti'ship scheme Category I and II			Category III		
	Grades A	Grades B	Mers'y	Grades A	Grades B	Mers'y	Grades A	Grades B	Mers'y
15				7¾d.	7d.	7¼d.			
16	10¾d.	9¾d.	9¾d.	9¼d.	8½d.	8½d.	1/0¾	11½d.	11⅝d.
17	1/0¾d.	11½d.	11⅝d.	11½d.	10½d.	10⅝d.	1/4¾d.	1/3	1/3¼
18	1/5¾	1/4¼	1/4½	1/4½	1/3¼	1/3½	1/9½	1/7½	1/8
19	1/11½	1/9¼	1/9¾	1/9½	1/7½	1/8	2/3½	2/0¾	2/1¼
20	2/5¼	2/2½	2/3	2/5½	2/2½	2/3	2/9¼	2/5¾	2/6½

Dublin Strike Ends

THE 73 weeks old strike of 100 electricians employed in Dublin by the C.I.E. (Government subsidised transport concern), ended last week-end, and the men returned to work on Monday. The strike, which started on June 15, 1951, and had immobilised 30 of Dublin's buses, began when the C.I.E. rejected a claim that the electricians should be paid 3s. 8½d. an hour—the local rate paid by contractors. Now a new union claim will be discussed.

CABLE MAKERS' RISE

ANOTHER increased wage award—applicable to workers in the electrical cable making industry, with effect from November 7, has also been announced. Under this award by the Industrial Disputes Tribunal the rates of the workers have been increased by 2d. an hour for men and 1½d. an hour for women, with corresponding rises for juvenile workers. But the bonus earnings of payment-by-result workers are not affected.

S.E. Board exhibits Ideas for Coronation

INDICATIONS are that preparations for next year's Coronation celebrations are gaining momentum. Local authorities had an admirable opportunity of finding ideas for their festivities when the S.E. Electricity Board staged a comprehensive display of flood- and other lighting units in the grounds of their Surrey sub-area H.Q. at Dorking recently. The main building was floodlit in amber, red and white, and surrounding trees were also picked out in colour to give a background to the wide range of decorative units exhibited. Among the new fittings shown were the Chrysaline features—many mounted on the H.Q. building.

One of the most attractive features was the fountain with wrought-iron gates, which were specially treated with fluorescent paints and activated by a battery of UV lamps. Manufacturers who took part by lending equipment included Falk, Stadelmann and Co., Franco-British Electrical Co., G.E.C., Imperial Lighting Co., Siemens Electric Lamps and Supplies Ltd., Strand Electric and Engineering Co. Ltd. and City Display Organisation.

Surrey sub-area H.Q. of S. E. Electricity Board at Dorking, floodlit and decorated during their exhibition of equipment suitable for Coronation festivities shown to local authorities and other bodies

Extra 2d. an Hour for Wiremen

JOURNEYMAN electricians in the electrical contracting industry have been awarded an increase of 2d. per hour with effect from Monday, November 17, with consequential adjustments in the rates of other classes of operative. This agreement between the National Federated Electrical Association and the Electrical Trades Union has been announced, although it was only a few weeks ago that it was revealed the Association had rejected the E.T.U.'s claim for a wage increase. The new hourly rates of

Journeymen		Adult Mates	
Grade "A" Mersey district	4/- 3/8	Bristol	3/0¼
		London	3/4¼
		Mersey	2/11¼
Grade "B"	3/7	Elsewhere	2/10¼

pay for journeymen electricians and adult mates in their respective areas are given in the table above, while those for other operatives are listed at the top of the page. This is their second increase this year. The last, also of 2d. an hour, operated from February 4. It is possible that the increase may shortly be followed by another, for Mr. Frank Foulkes, President of the Electrical Trades Union, tells us that the E.T.U. accepted this award on the understanding that negotiations would go on for a further 1d. an hour for journeymen.

ALL CONTRACTORS SHOULD REGISTER

AT the recent annual dinner of the Electrical Contractors' Association of Scotland, the president, Mr. R. A. Smith, urged the compulsory registration of electricians in an effort to prevent shoddy work. He said the increased cost of electrical installations had deterred many consumers, who had turned to the contractor who offered cheap work. The consequence was that more unqualified workers had gone into business, turning out poor work. Mr. Smith stated that approaches to Government departments concerning compulsory registration had not been received with much enthusiasm, largely because of conflicting views from organisations in England and Wales.

Kitchen Planning

A NEW brochure profusely illustrated with photographs and diagrams, and entitled "Electric Kitchen Planning," has been published by the Electrical Development Association. The initial layout of a new kitchen, whether it be small, medium or large in size, is discussed fully with advice on the arrangement of various apparatus and furniture, storage space and lighting equipment. Also dealt with at length is the addition of items to existing kitchens and the apparently simple projects of installing improved lighting fittings and socket outlets to permit the use of more labour-saving devices. Sixteen of the pages have been devoted to photographs and reproductions of plans.

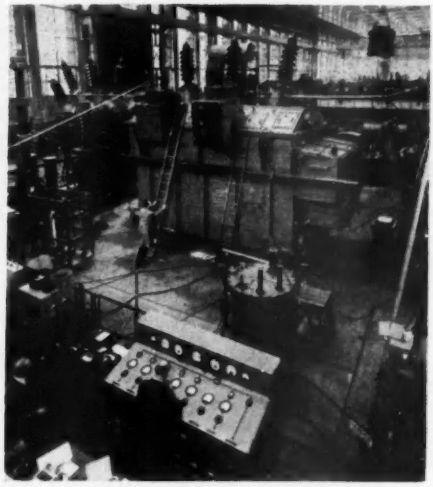
OFFICIAL PUBLICATIONS

STATEMENT OF GUARANTEE in respect of proposed loans by B.E.A. (see page 942). H.M.S.O. 2d.

CIVIL INDUSTRY AND TRADE. Wartime history of Board of Trade. H.M.S.O. 37s. 6d.

NATIONALISED INDUSTRIES. Report of Select Committee (see this page). H.M.S.O. 9d.

GAS COUNCIL. Third Report and Account for 1951-52 see page 922). H.M.S.O. 5s.



What must be at least one of the largest transformers to be installed in Great Britain is pictured here in the works of Ferranti Ltd., the manufacturers. Destined for the Low Rd. (Leeds) substation, it is a 100 MVA, 3-phase 132/33 kV star delta connected transformer with on-load tap charging gear on the 132 kV winding of the continuously rated reactor type

Lord Citrine on Staff Responsibility

ONE of the hardest things to do in a big organisation is to get people to take responsibility. That is the opinion of Lord Citrine, chairman of the B.E.A., as expressed in evidence before a House of Commons Select Committee on Nationalised Industries. His lordship went on to speak of a "tremendous fear of doing something which may be setting a precedent."

Describing his attitude to this, he said, "We have striven hard for four years to try to get people to realise that they cannot expect everything to be done at the centre. In other words, we have pursued a policy of decentralisation. We have been saying to people, 'We will accept a percentage of mistakes. We will not tell you what the percentage is. We will not guarantee we will excuse you in a particular mistake, but we do not expect perfection. We want you to take your responsibilities.' "

The committee was concerned with questions in Parliament on the subject of the nationalised industries, and Lord Citrine thought that if these were permitted on day-to-day activities, then the officers of the boards would get the "Civil Service mentality."

In its first report, the Select Committee recommends that the present arrangements as regards questions remain substantially unchanged, apart from a technical modification in terms of procedure. It intends, however, to consider whether additional machinery should be established to deal with the annual reports and accounts of the various corporations.

Trials of Peat Burning Gas Turbine

SUCCESSFUL test runs have now been completed on the peat-burning gas turbine which is being built by Ruston and Hornsby Ltd. for the Ministry of Fuel and Power. The turbine, which drives a 750 kW alternator, has operated on powdered peat, a practicable method of controlling the feed of this to the combustion chamber having been developed.

Exhaust gases from the turbine are to be used for final drying of the peat, after two-thirds of its 90% water-content in the as-cut condition have been removed by pressing.

At present the gas turbine is being prepared for continuous running, in the light of experience gained during the trials. The next stage in its development will be transfer to a Scottish peat bog where it will operate with a press and drier.

N. RHODESIAN COPPER STRIKE ENDED

Its Effect on Supplies to U.K. Industry

THE strike of African workers in the Northern Rhodesian copper belt ended last week. Some 3,700 workers were involved in the strike which lasted three weeks. Native employees returned to work pending further negotiations in a dispute which involves, among other matters, principles of relationship between European and African workers, but is based initially on a wage claim for an extra 2s. 8d. a day. It might be premature to say that the strike has ended finally, following a breakdown in discussions. A resumption of the strike seems unlikely, however. In the first place, negotiations were re-opened at the request of the strikers. Also, it has now been reported that the case has been submitted to arbitration. Reports indicate that it is doubtful whether the four companies involved would agree to the full wage claim unless decreed by an arbitration court.

In the meantime a number of guesses have been made, following the freeing of the lead and zinc markets, that copper would also be freed from control in the near future. It has been suggested that the N. Rhodesian strike would delay such an event. An official of the Ministry of Materials stated last week that this might be so inasmuch as any cessation in production would be likely to affect supplies, but N. Rhodesia produces only ¼ of the total world production. The possibility of freeing the copper market hinged on a number of factors, the Rhodesian strike being only one consideration. He said that if all went well there was no likelihood of a reduction in allocations to U.K. industry. Stocks and supplies were adequate for normal working and normal fluctuations in trade demand.

Lighting Factories

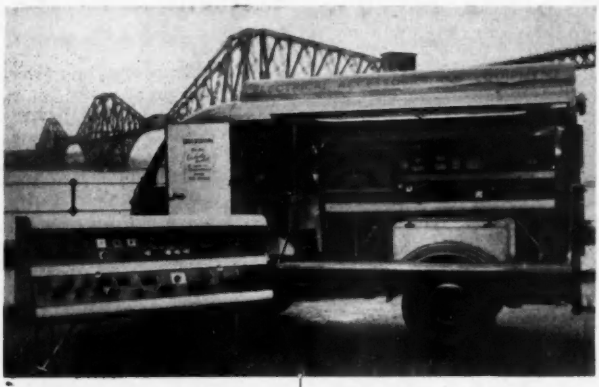
IN the first of three papers presented to the Illuminating Engineering Society last week, Mr. T. S. Jones reviewed developments in factory lighting during the last decade, showing how these had demonstrated the necessity of eliminating direct glare. On colour blending Mr. Anderson advocated lamps combining mercury vapour and tungsten filament sources to obtain a light superior to that of tungsten alone. The final speakers, Messrs Middleton and Harper, discussed lighting in explosives plants.

Renovation of Old Underground Coaches

EXTENSIVE reconditioning and renovations are now being carried out by London Transport on their 'F' class rolling stock, operating at present on the Metropolitan line. The original estimation of life of these cars was 30 years, but in view of their good structural condition they are being retained for a further 10 years. There is a total of 99 cars in this class.

One of the most important aspects of the reconditioning is the renewal of electrical power cabling and control wiring. The standard driver's brake controllers of the original pattern are being replaced by self-contained standard units from tube cars. The hitherto somewhat austere appearance of the interior is also being improved. One of the most notable improvements being the addition of lamps along the sides and at the ends of the cars. The push-button method of opening individual doors will also be introduced. Other improvements will comprise normal overhaul work and repainting as well as the provision of better brakes, buffers and couplers.

Above is the interior of a renovated type 'F' underground car with additional lamps placed along the side. Left shows recabling of traction control equipment on one of the same type of stock.



Ediswan's demonstration van pictured during its current tour of country exhibiting Clix electrical accessories. The van contains a wide selection from the company's range of products

NEWS IN BRIEF

Eighty years ago the *Telegraphic Journal and Electrical Review* commenced publication, the earlier part of the title being dropped subsequently. We offer to the *Electrical Review* hearty congratulations on this jubilee.

Due to misunderstanding, in the report of the joint meter-reading scheme in our October 30 issue, we stated that experiments were being carried out in the Merseyside and N. Wales Area. This is incorrect. The Consultative Council's chairman was referring to the project in general and not to the particular Area.

Autumn meeting and A.G.M. of the Iron and Steel Institute will be held at 4 Grosvenor Gardens, S.W.1, on November 26 and 27.

Forty Southern Electricity Board graduates and engineers attended the third Graduate and Engineers' Two-day Convention held at Maidenhead recently.

A new edition of the A.S.E.E. brochure outlining the aims, objects, membership qualifications, benefits and other details concerning the Association, has just been published. It has been revised to include revisions of and additions to rules brought into force last July.

Annual meeting and luncheon of the Birmingham branch of E.I.B.A. has been arranged for December 5. It will take place at the Imperial Hotel, and tickets will cost 12s. 6d.

Not B.R.A. Members

IN AN action brought by British Refrigeration Association against Hertford Refrigeration Co., Ltd., W. M. Lewis and Son, Ltd., and Abage (Fulham) Ltd., Mr. Justice Dankwerts granted an interlocutory injunction restraining the defendants and each of them by their servants, agents or otherwise, from representing that they are members of the Association.

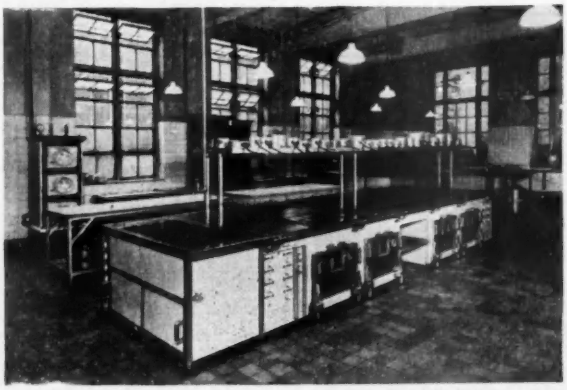
Students' Dance

ONCE again this year the Victoria Halls, Bloomsbury, were the venue for a successful winter dance organised by the London Students' Section of the I.E.E. Members, together with guests from similar sections of other senior Institutions. spent an enjoyable evening.

Chefs to Receive Electrical Tuition

THE gradually increasing number of all-electric kitchens being installed in large catering establishments has given rise to a corresponding rise in the demand for chefs who are familiar with cooking by electricity. To meet this demand the L.C.C. have recently installed two multi-oven electric ranges at the Westminster College Hotel school. These ranges were designed and built by the G.E.C. and replace two gas heated ranges.

The larger range measures 21 ft by 6 ft, has eight ovens with boiling plates over and intermediate boiling tables alongside. The ovens are heated by sheathed wire heating elements, and the range has a total loading of 159·5 kW. Accompanying switchboards were made by Westwood Switchgear Ltd. The smaller range has the same number of ovens, measures 19 ft by 6 ft and has a total loading of 139·5 kW.



One of the two large electric ovens installed by the G.E.C. for student chefs at Westminster Technical College's Hotel School

Questions in Parliament . . .

Monopolies Commission

Mr. Thorneycroft was pressed for an answer at question time last week concerning the Bill to strengthen the power of the Monopolies Commission. He reiterated the decision not to introduce such a Bill during the present session. While thinking it desirable that the Commission's work should be extended to cover nationalised industries he said enough time had been spent discussing the matter during the debate on the address.

Materials Conference

Some information was given in *Hansard* on Friday about the work of the International Materials Conference and its future plans. The various committees have reviewed the production, consumption and distribution of the more important raw materials. Where they were in short supply the Conference has continued to make allocations to consuming countries. Measures to effect economies have also been considered and in a number of cases implemented. Some committees are studying long-term problems of a number of commodities and considering what recommendations can be made to increase production over a period of years.

Interest on Stock

The Prime Minister said he would not introduce legislation to reduce the interest payable on stock issued by way of compensation to previous shareholders, in order to relieve the burden on nationalised industries. A Motion on the Paper calls for a committee of inquiry to ascertain what measures could be taken to reduce the compensation which is a heavy burden on nationalised industries. The Prime Minister said he would deal with the matter if and when the Motion was successful in the Ballot.

Production in Engineering

It was stated in a written answer that during the year ended last June, total production of the engineering industries was higher than in the preceding 12 months.

Accidents in the Home

Sir David Maxwell Fyfe stated last week that he was considering methods of giving wider publicity to the need for preventing accidents in the home. He added that the suggestion of a safety week would be borne in mind.

Television Reception

The Assistant Postmaster-General was again questioned last week concerning the siting of television masts in various parts of the country. As regards Cornwall and Devon, he stated that a station near Hensbarrow would not give satisfactory service to large parts of Devon outside the range of Wenvoe. A site was now being tested in S. Devon. Details were also being examined to provide an additional mast at Redruth to enable all three programmes to be radiated from that station.

Mr. Gammans also referred to faulty radio reception in Orkney and Shetland. He stated that no material improvement could be made with existing transmitters which were working at maximum power. There was little hope at present of providing stations in that area. Investigations had shown that reception of the Scottish Home Service was generally satisfactory although subject to some fading and interference after dark. Fair reception of the Light Programme was possible on the long wave.

Legislation on Weights and Measures

A decision about legislation on weights and measures had been taken, announced the President of the Board of Trade. Action had already been started on those recommendations of the Committee of Inquiry which did not involve legislation. Consultations with the trading, local authority and other bodies concerned were being arranged to embody in legislation those recommendations designed to remove anomalies and confusion. Other recommendations which suggested more fundamental changes, such as those relating to wholesale transactions and responsibility for administration, would have to await further consultations.

He went on to say that the Government would not proceed with the recommendation for the eventual abandonment of the Imperial for the metric system of weights and measures. The Commonwealth had, however, supported the proposal that a firm and legally defined relationship between the Imperial pound and yard, and the international metre and kilogramme should be established. Due to the complexity of the matter, it was unlikely that legislation would be introduced for some time.

The Metric System

Asked if he would bear in mind as a possible long-term solution of some of our international trade difficulties, the adoption of the metric system, the President of the Board of Trade said he had also been impressed in the course of consideration of this matter, by the very considerable dislocation which would take place during any change-over.

Inspector of Factories' Report

The House was told last week that the report of the Chief Inspector of Factories for 1951 was with the printers and it would be published as soon as possible.

Industrial Stokers

Mr. C. Lloyd said on Monday that he was discussing the question that industrial stokers should be encouraged to raise their efficiency arrangements for improving their status in accordance with the Ridley Committee's recommendation.

Electric Supply News . . .

Caernarvonshire

The resumed inquiry by the Ministry of Fuel and Power into the B.E.A.'s proposal to compulsorily acquire land on the summit of Mynydd Annelwog in the Lleyn peninsula, on which to erect a wind driven generator, was concluded at Aberdaron on Friday last. Mr. J. B. Griffith, representing the Council for the Preservation of Rural Wales, claimed that a windmill would introduce a restlessness to the area alien to its peace. Mr. W. R. P. George, who represented several objectors, said that the site was common land and belonged to the people of the district. Installation of the windmill by the B.E.A. would not benefit the residents and would not bring electricity nearer to anybody's home. He also claimed that it would drive many visitors away. For the National Trust and the Commons Preservation Society, Mr. J. D. Tisley asked the B.E.A. to find a less valuable site from the public access and scenic points of view. On behalf of the B.E.A. Mr. Ramsay Willis submitted that the question of common land did not arise at this stage and that an additional source of electricity would in due course benefit the Aberdaron area. Only 1½ acres of land was involved, and the B.E.A. was prepared to co-operate to ensure the preservation of the amenities. The inquiry was conducted by Mr. A. N. East.

Northumberland

The County Council has decided to take no further action regarding opposition to the erection of a 275 kV grid line from Stella (Blaydon) to Carlisle, a distance of about 50 miles. The National Farmers' Union proposed that the line should be erected in a more southerly direction so that it would interfere less with agricultural land. The Ministry of Fuel and Power has not approved the change and in confirming the B.E.A.'s route said that the new line would be of considerable national importance and should be so constructed and sited as to ensure the maximum possible reliability of supply and reasonable ease of access for maintenance and repair. The Ministry stated that the more southerly route proposed by the Farmers' Union would not satisfy these conditions.

Scotland

A scheme to end the electricity-gas rivalry in new Scottish housing areas, has been suggested by the Scottish Gas Consultative Council. The chairman of that Council has instanced the scheme now in force between the North of Scotland Hydro-Electric Board and Aberdeen Corporation under which the latter pays to the Board a flat rate charge of £5, so that each house is equipped with both gas and electricity, thus providing the tenant with freedom of choice. The Scottish Gas Consultative Council consider that arrangement fair and reasonable, and has suggested that there should be a conference with the Gas Board and the three Electricity Boards with a view to adopting a similar scheme throughout Scotland.

South Wales

If conditions remained as at present there was little hope of the South Wales Electricity Board's scheme for a main distribution network, to bring all villages, farmhouses and other premises within about a mile of a h.v. line, being completed for at least 50 years. This conclusion has been given to the Carmarthenshire County Planning Committee, following a survey of public utility services. The total cost of the main distribution network for the South Wales rural area was estimated at approximately £15 million. The initial programme, approved by the South Wales Electricity Consultative Council, was estimated to cost £300,000 and was expected to be carried out within two years, but has been held up by restrictions on capital.

Southwark

Further representations to the London Electricity Board have been made by Mr. G. Isaacs, M.P. for Southwark, suggesting that the Board should take over installations of the Fixed Price Light Co. The Board has now set out its objections concerning five roads specified. In all but one of these the revenue which could be expected would be small in relation to the considerable capital expenditure involved, the Board states.

LIGHTING SCHEMES

Birkenhead.—The Finance Committee proposes to spend £2,000 on the purchase of flood-lighting equipment.

Bournemouth.—T.C. to install improved street lighting on housing estates, at a cost of £1,000.

Chepstow.—U.D.C. is to apply for M.o.T. approval to install fluorescent lighting along the main road. Fifty concrete columns will be required.

Darlington.—Consent has been received to the borrowing of £4,476 for improved lighting in Coniscliffe Road.

Friern Barnet.—The U.D.C. is seeking consent to borrow £5,525 for improved lighting in Woodhouse Road and Friern Barnet Road.

Maidstone.—To apply for sanction to borrow £2,928 for the lighting of roads on a portion of the Shepway Estate.

Morecambe.—Requested by the T.C. to contribute £5,000 to finance next year's illuminations, the local Chamber of Trade has asked the Council for permission to take over the illuminations along the promenade.

Salford.—The Finance Committee has agreed to the expenditure of £23,550 on street lighting (including new lighting for the whole of A.6) during the next financial year.

Company Activities . . .

British Electric Resistance Co.

The rather pessimistic note in the chairman's statement last February does not seem to have been borne out by the results for the year to July 31, just announced. These show a net profit of £11,497 as against £10,483 for the previous year, after charging increased taxation, according to the preliminary statement. The dividend also is raised by 5% with a final of 15%, making a total of 25% for the year.

Broadcast Relay Services Ltd.

Ordinary stockholders took up nearly all the 927,430 Ordinary 5s. shares offered in the provisional allotment. The small balance, added to those not absorbed in the allotment, provided 42,546 Ordinary "excess" shares. As applications for extra shares were considerably higher, these have been distributed to stockholders in proportion to their holdings.

Bullers Ltd.

With a reduction of over £50,000 in trading profit, the net profit figure also is slightly lower than for the previous year. But with a final dividend of 10% the distribution for the year is again 15%, but on a larger capital. During the year the plant at the Porcelain Works was fully occupied, but the ironworks suffered from a shortage of steel. Extensions to plant and buildings resulted in a higher turnover, but the rising costs reduced the profit, say the directors. Further extensions to the plant are under construction.

Year to July 31	£ Trading Profit	£ Net Profit	% on Ord.		Ord. Price	
			Earn'd	Paid	High	Low
1948	310,270	108,501	122	15	26/-	23/6
1949	304,281	115,044	129	15	27/10½	25/-
1950	367,137	151,106	171	15	27/6	24/10½
1951	365,689	138,167	128	15*	32/6	25/-
1952	307,975	111,579	—	15†	25/6	24/1

* Plus 28% capital bonus. † On larger capital.

Heenan and Froude Ltd.

The group profit for the year to the end of August last, at £394,003 shows a satisfactory profit over the previous year's total. The total dividend also has been increased from 15% to 17½% on the slightly enlarged capital, with the payment of a final of 10%. After charging taxation, etc., the net profit is £144,515, compared with £140,943 for the previous year. Since the date of the accounts notice has been received of further options exercised to convert 32,520 Preference shares into 48,780 Ordinary shares at the end of this month, the directors state. These shares will rank with existing Ordinary shares on that date and provision has been made in the accounts for the additional proposed dividend payable.

Tube Investments Ltd.

Another crop of records was set up during the year ended July 31 last. Sales in fact increased by nearly £9 million. To the group's total profits the Electrical Division made a not unsatisfactory contribution, despite the restrictions both at home and abroad, which affected manufacturers of domestic electrical goods, states Mr. I. A. R. Stedeford, chairman. The question might be asked whether it is intended to discourage the use of electricity for domestic purposes for another generation, for it would seem that this is what the present policy means, he goes on. This prolonged period of depression by decree in the domestic electrical goods industry is forcing households and manufacturers alike to turn their attention elsewhere. Any change of heart in national fuel policy would certainly receive the enthusiastic co-operation of manufacturers of electrical goods, but there is a limit to the years they can wait for it, Mr. Stedeford states. He also indicates that the price relationship of aluminium to steel has moved considerably in favour of steel. If that trend continues, then both producers and fabricators of aluminium must suffer, he points out.

Year to July 31	£ Trading Profit	£ Net Profit	% on Ord.		Ord. Price	
			Earn'd	Paid	High	Low
1948	6,169,034	2,071,200	98	25	7⅞	5¾
1949	5,919,249	2,064,075	97	25	6¼	5⅛
1950	7,175,122	2,686,901	127	25	6⅛	5⅛
1951	8,694,400	2,979,162	168	25	7¼	5¼
1952	9,291,834	3,388,970	90	21*	59/6	48/9

* Final 8½% on capital increased by 100% bonus.

Dividends Declared

Birmid Industries.—Dividend 10% plus bonus of 1½% (*25% on smaller capital*). Group profit after all charges, £961,234 (*£848,525*).

B. and F. Carter Ltd.—Dividend of 17½% (*same*). Net profit is £9,595 (*£13,941*).

Jensen and Nicholson.—Interim of 5% (*10%*).

Johnson and Phillips.—Interim of 7½% (*same*). The directors state that trading for 1952 is running at a substantially lower level than last year, but should cover a dividend of 15%, equivalent to that paid last year.

Richard Johnson & Nephew.—Interim of 2% (*4%*) on doubled capital.

Revo Electric Co.—Interim of 10% (*5%*). The increase is to reduce disparity between the interim and final dividends, it is stated.

Senior Economisers Ltd.—Interim of 30% (*same*) payable on December 4.

S. Smith and Sons (England) Ltd.—Final of 10% again making 12½%. Consolidated profit is £1,520,031 (*£1,248,229*).

Telephone Manufacturing Co.—Interim of 2½% (*same*).

Ward and Goldstone.—Interim of 15% (*20%*) on increased capital, payable on December 15.

Commercial Information

CONTRACTS OPEN

HOME

Nov. 21.—Belfast. Supply and erection of workshop machinery equipment, including 12¾ in. and 6¾ in. centres surfacing and screwcutting of gap bed lathes, radial drilling machines, sensitive drilling machine, and 24-in. shaping machine, for Harbour power station. Merz and McLellan, consulting engineers, Carliol House, Newcastle-on-Tyne. Deposit £5 5s. (See Oct. 23 issue.)

Nov. 21.—Edinburgh. Electrical work for north development (56 houses), west devel. (44 houses) and east devel. (18 houses and 12 shops) on Drylaw Mains site. City Architect, City Hall.

Nov. 22.—Banbury T.C. Supply and installation of equipment for illumination of pedestrian crossing beacons. Borough Engineer and Surveyor, Municipal Buildings.

Nov. 22.—Grimsby T.C. Supply of 80 flasher units (240 V 50 c/s a.c.), 75 box-type housings, 80 plastic globes, mounting galleries, lampholders, etc., for lighting pedestrian crossings. J. V. Oldfield, Borough Engineer and Surveyor, Municipal Offices. Town Hall Square.

Nov. 22.—Wakefield R.D.C. Electrical installation in 58 houses on sites within the rural district. Council's Engineer, Council Offices, 18 St. John's North.

Nov. 24.—Boston R.D.C. Electrical pumping machinery required for Bulterton Re-Pumping Station. S. M. Forman, clerk of district council, 126 London Rd. Deposit £3 3s.

Nov. 24.—Edinburgh. Electrical installation in 136 houses in Inch Housing area B. City Architect, City Chambers.

Nov. 24.—Manchester. Electrical installations for shops and maisonnettes at Northern Moor N.W. sub-centre and Sharston and Benchill S.E. sub-centre. City Architect, Town Hall. Deposit £1 1s. (See Nov. 13 ssue.)

Nov. 24.—Nuneaton T.C. Provision and installation of sodium street lighting over about 1,530 yds. to Group A standard. Borough Surveyor, Council House. Deposit £2 2s. (See Nov. 6 issue.)

Nov. 24.—Sale T.C. Electrical installations for 40 dwellings, 40 houses and 24 houses on Oakley Farm estate, and 46 dwellings and 50 houses on Baguley Lane estate. These are all separate contracts. Borough Engineer, Town Hall. Deposit £2 2s.

Nov. 24.—Tyneside. Supply of stores for Tyne Improvement Commission include electrical cable. Documents from N. M. Hood, general manager, Bewick St., Newcastle.

Nov. 24.—West Riding. Modifications and repairs to electrical installations at Holme Valley grammar school. County Architect, "Bishopgarth," Westfield Rd., Wakefield.

Nov. 24.—Worcester. Electrical equipment for residential nursery at The Firs, Whittington. Documents from Children's Officer, 26 The Butts.

Nov. 25.—Hythe T.C. Supply of equipment for illumination of pedestrian crossing beacons. K. C. R. Ashby, Municipal Offices, 1 Stade St. Deposit £1 1s.

Nov. 25.—Newbiggin-by-the-Sea U.D.C. Electrical work in 12 houses on Spital Estate. H. Selby Robson, Surveyor to Council, Council Offices. Deposit £2 2s.

Nov. 25.—Wembley T.C. Conversion to electricity of public lighting in Barnhill Rd. and Chalk Hill Rd. Borough Treasurer, Town Hall. Deposit £2 2s.

Nov. 26. — Carmarthenshire. Supply of 28 beacon globe assemblies and equipment for pedestrian crossings. J. L. Richards, county engineer and surveyor, Roads and Bridges Dept., County Hall, Carmarthen.

Nov. 26.—Formby U.D.C. Supply of concrete street lighting columns for period ending Dec. 31, 1953. Engineer and Surveyor, Council Offices.

Nov. 26.—Mountain Ash U.D.C. Supply of an electrically driven universal woodworking machine —if below 2 h.p. motor should be 230/250 V 50/s single-phase a.c., and if above, 400/450 V, etc B. M. Murphy, Clerk of Council, Town Hall.

Nov. 26.—West Hartlepool T.C. Electrical installation in new Rossmere primary school. Borough Architect, Municipal Buildings.

Nov.28.—Heckmondwike U.D.C. Electrical work in 14, 6 and 8 houses (three contracts) on Dale Lane estate. Council's Surveyor, J. K. Gerlick, 6 Church St. Deposit £2 2s.

Nov. 28.—King's Lynn T.C. Supply of equipment for lighting ten pedestrian crossings. Borough Surveyor, 27 Queen St.

Nov. 28.—Middleton T.C. Installation and wiring for illumination of nine pedestrian crossings. Borough Engineer and Surveyor, Town Hall.

Nov. 28.—Stepney B.C. Electrical installation in blocks of flats in Sidney St. scheme. Sydney Clough, Son and Partners, Devonshire Close, 39 Devonshire St., W.1. Deposit £2 2s. (See Oct. 23 issue.)

Nov. 29.—Ayr T.C. Supply of 21 flasher units for lighting of pedestrian crossings. Borough Surveyor, Town Buildings.

Nov. 29.—Stalybridge T.C. Conversion of street lighting from gas to electricity, comprising supply of swan necks to existing columns, new concrete columns, 80 W H.P.M.V. lanterns, time switches, etc., for some 420 lamps. G. D. Sanderson, Borough Engineer, Town Hall.

Nov. 30.—Tottenham B.C. List of supplies required during year beginning April 1, 1953, includes electric lamps. Applications to M. Lindsay Taylor, Town Clerk, Town Hall, N.15.

Dec. 1.—Chippenham. Rewiring for power, lighting, patients' call system and radio system at St. Andrew's Hospital. A. N. Irens, consulting engineer, Haycroft, Filton, Bristol. Deposit £2 2s. (See Nov. 6 issue.)

Dec. 1.—East Riding. Installation of electrical services at Cottingdean secondary school. Application to County Architect, County Hall, Beverley.

Dec. 1.—Farnworth T.C. Installation of electric lighting and heating in 36 houses on Plodder Lane South site. Borough Engineer and Surveyor, Town Hall. Deposit £1 1s.

Dec. 1.—Manchester. Electrical installation at 'F.' Home, "Newholme," Nell Lane. City Architect, Town Hall. Deposit £1 1s. (See November 13 issue.)

Dec. 1.—Rothwell (Yorks) U.D.C. Electric wiring of 48 houses on Haigh Rd. site. Documents from R. A. Easdale and Son, architects, County Chambers, Bradley St., Castleford.

Dec. 1.—St. Helens T.C. Supply, erection and wiring of 66 concrete standards with 250 W H.P.M.V. lanterns for new street lighting scheme. M. Ward, Borough and Water Engineer, Town Hall. Deposit £2 5s.

Dec. 1.—West Riding. Renewal of electrical installation at Elland grammar school. County Architect, "Bishopgarth," Westfield Rd., Wakefield. Deposit £2 2s. (See November 13 issue.)

Dec. 8.—West Hartlepool T.C. Supply installation, etc., of electrically driven sewage pumps and ancillary plant and equipment. Borough Engineer and Surveyor, Municipal Buildings.

Dec. 8.—West Riding. Renewal of electrical installation in Goole grammar, and Henley C.E. schools. County Architect, "Bishopgarth," Westfield Rd., Wakefield. Deposit £2 2s. (Advertised in this issue.)

Dec. 10.—Ilkley U.D.C. Installation of mercury lighting (involving 62 columns) in new street lighting scheme. Council's Surveyor, Town Hall. Deposit £3 3s.

Dec. 10.—Newcastle-on-Tyne. Substitution of electric lighting for gas in 930 houses on Walker estate (contract in nine sections). City Architect, 18 Cloth Market.

Dec. 11.—Widnes T.C. Supply, erection, and fixing of 1·21 miles of street lighting to Group A. Borough Engineer and Surveyor, Town Hall. (Advertised in this issue.)

Dec. 16.—Bromley T.C. Improvement of street lighting along 1¼ miles of London Rd., High St., and Masons Hill. Applications to Borough Engineer, Municipal Offices, by Dec. 2. Deposit £2 2s. (Advertised in this issue.)

Jan. 5.—Bletchley U.D.C. Nine sets of electrically driven vertical unchokeable sewage pumps and ancillary equipment for three pumping stations. Engineers are John Taylor and Sons, Artillery House, Victoria St., London S.W.1. Deposit £5.

Jan. 10.—Dagenham T.C. List of supplies for year beginning April 1 next includes electrical lamps and supplies. Borough Engineer and Surveyor, Civic Centre.

No date stated.—Hastings T.C. Electrical installation in 122 dwellings at Harley Shute estate. Borough Engineer, 37 Wellington Square. Deposit £2 2s.

No date stated.—Doune (Perth) T.C. Electrical work in erection of block of flats for old people. Apply, D. A. McNeill, Town Clerk, Dunblane.

OVERSEAS

*Details of items marked * may be obtained on application to the Board of Trade, Horseguards Avenue, S.W.1, quoting reference.*

Dec. 4.—Pakistan. Supply of electrically driven vacuum exhausters for testing vacuum-brake equipment on railway rolling stock. Director General of Supply and Development, Frere Rd., Karachi. B.o.T. (Ref.: CRE 38584/52)*.

Dec. 15.—Formosa. Supply of test switchboard for general test work, (125/500 V, 3-phase, a.c.; 125 V d.c.) and test set for Central Trust of China, 96 Po Ai Rd., Taipei, Taiwan. B.o.T. (Ref. CRE 37539/52)*.

Dec. 15.—India. Director General Supplies and Disposals, Shahjahan Rd., New Delhi, invites tenders for various woodworking machinery suitable for 400 V, 3-phase, 50 c/s, a.c. B.o.T. (Ref. CRE 37915/52)*.

Dec. 20.—India. Supply and erection of 11 kV switchgear for eight substations. Secretary, Stores Purchase Committee, Trivandrum, Travancore-Cochin State, S. India. B.o.T. (Ref.: CRE 38581/52)*.

Jan. 30.—Brazil. Tenders are being invited for erection of complete hydro-electric power station at Rio Alpim, Campo Formoso Municipality, Bahia. Divisas de Projetos, Praca Pio X, 78, Rio de Janeiro.

CONTRACTS PLACED

Dudley T.C. Installation of electricity in 204 houses and 60 flats, Goldsmith and Cantrill, £6,776.

Jarrow. Electrical installation at Central Modern school, Dougal and Railton, £2,552.

Kendal T.C. Reorganisation of street lighting in various roads in district, General Electric Co. Ltd., £6,887.

Leeds. Supply of 25,000 yd. aerial cable, W. T. Henleys, Ltd., £1,369; and 180 uplift brackets, General Electric Co., Ltd., £832.

Your Queries Answered

"Geni" lighting fittings, makers of? S.J.—Lustro Distributors Ltd., 25 Millbank, S.W.1. (24396)

Replacement neon tube for tester with metal caps at the ends, makers of? S.W.—Philips Electrical Ltd., Century House, Shaftesbury Ave., W.C.2. (24403)

Tie press electrically heated, makers of? W.W.—We know of no firm, at the present time, making electrically heated tie presses other than the trouser creasers which could be used for this purpose. (24409)

"Harbrix" instantaneous water heaters, makers of? P.S.—Harbrix Industries Ltd., Nelson Place, Rock Ferry, Birkenhead. (24425)

"Syrene" hairdryers, makers of? Y.B.—These were made by Household Machines Ltd., Salisbury House, London Wall, E.C.2, but try: Osborne Garrett and Co., Ltd., 51 Frith St., W.1, regarding repairs. (24418)

"Barlite" fluorescent tubes, makers of? F.H.—These were made by Barlite Developments Ltd., of Bath St., Hanley Stoke-on-Trent, a firm which went out of business about four years ago. (24436)

"Fanfare" kettle, makers of? S.E.—Best Products Ltd., Felix Works, Felixstowe. (24442)

The above are selected from questions we have answered this week. If you have a query, send it to us.

TRADE NOTES

Change of Address. The head office of Midland Silicones Ltd. is now at 19 Upper Brook St., London, W.1. Tel.: Grosvenor 4551.

Change of Name. British Electronic Products (1948) Ltd., which became one of the subsidiary companies of the Lancashire Dynamo Group early in 1950, has now changed its name to Lancashire Dynamo Electronic Products Ltd. Manufacture and development will continue without interruption under the new title, from the same address—B.E.P. Works, Rugeley, Staffs.

Acquisition. Crompton Parkinson Ltd. have acquired the assets of Cyc Arc Ltd. The business in stud welding equipment is being transacted by a department under the style of Crompton Parkinson Ltd.: Cyc Arc Stud Welding Division, 1/3 Brixton Rd., S.W.9. Tel. Reliance 1636.

PRICES OF CABLE METALS AND OTHER MATERIALS
(at Tuesday night)

	£ s. d.	New York price
COPPER, electrolytic	285 0 0	—
LEAD, good soft pig (foreign)	97 7 6	116 0 0
,, ,, ,, "English" quality ...	98 17 6	
TIN (99-99.75%) ... ...(Cash)	965-967	—
,, (3 months)	946-947	—
ALUMINIUM, commercial purity (del.)	166 0 0	—
ZINC	110 0 0	100 0 0
ARMOURING:		
Galv. Steel Wire (0.104 in.) ...	53 0 0	—
Mild Steel Tape (0.04 in.)	39 15 0	—

NEW COMPANIES

Extracted from the Register issued by Jordan and Sons, Ltd., 116 Chancery Lane, London W.C.2.

Auto Electrical Services (Hants), Ltd., 25 Lime St., Aldershot, Hants. Electrical engineers and contractors, motor engineers, electricians, etc. Cap.: £1,000. Dirs.: A. F. Thorpe and G. Tivey.

Barber Switchgear Co., Ltd., Electrical Works, Holliday St., Birmingham 1. To take over business carried on at Birmingham as Barber Switchgear Co. Cap.: £5,000. Dirs.: Mrs. B. I. Barber, H. N. Barber and Mrs. B. M. Bishop.

Cables and Conductors, Ltd., Broadmead Hse., 21 Panton St., S.W.1. To acquire patent rights and brevets d'invention; manufacturers of and dealers in electrical appliances, etc. Cap.: £1,000. Dir.: B. Zucker.

Countertubes, Ltd., Dunbar Works, Dunbar St., W. Norwood, S.E.27. Research workers, manufacturers of and dealers in electronic devices, radio valves and apparatus ionisation chambers, geiger counters, etc. Cap.: £100. Dirs.: G. A. R. Tomes, S. A. Reed, A. J. Tomes and F. Spencer.

P. H. Fitzgerald and Co., Ltd., 57 Lee High Rd., S.E.13. Electrical, mechanical, marine, constructional, internal combustion and general engineers, etc. Cap.: £1,000. Dirs.: P. H. Fitzgerald and Hilda E. Fitzgerald.

Frank Foster and Sons (Blackburn), Ltd., Fecitts Yard, Weir St., Blackburn. Mechanical, electrical and general engineers, etc. Cap.: £2,000. Dirs.: F. Foster, R. H. Foster, T. F. Foster and Mrs. J. A. Foster.

W. D. Horne and Co. Ltd., Woodbridge House, 30 Aylesbury St., Clerkenwell Green, E.C.1. To take over business of W. D. Horne and Co., carried on at Aylesbury St., E.C.1, mechanical engineers, electrical component manufacturers, etc. Cap.: £25,000. Dirs.: H. R. Soar, G. B. Soar and F. W. Welland.

Hyndburn Electronics Ltd., 2 and 4 Croft St., Accrington, Lancs. Cap.: £1,000. Dirs.: G. K. Talbot and A. Wallwork.

GAZETTE ANNOUNCEMENTS

COMPANIES ACTS

Altass Electric Co. Ltd. Petition for winding-up presented on Nov. 11, and is directed to be heard before Royal Courts of Justice on Nov. 24. Interested parties should contact Cochrane and Cripwell, 119 Finsbury Pavement, E.C.2, by Nov. 22.

British Transformer Oil and Lubricants, Ltd. Meeting of members will take place at 170 Piccadilly, W.1, on Dec. 18 at 12 noon to receive liquidator's report.

Celestion, Ltd. Final meeting of members will be held at 79 Cheapside, E.C.3, on Dec. 10 at 12 noon to receive liquidator's report.

C. V. P. (Electrical), Ltd. Meeting of creditors will be held at 211 Lr. Addiscombe Rd., Croydon, on Dec. 13 at 10.30 a.m., to receive liquidator's report.

A. W. Fisher and Sons (Ipswich), Ltd. Resolution for voluntary winding-up passed at meeting on Nov. 6. R. A. Paterson, C.A., 45 Princes St., Ipswich, has been appointed liquidator, to whom creditors are asked to send particulars by Nov. 30.

L. P. Fox and Co., Ltd., radio and electrical engineers. Meetings of creditors and contributories to take place today (Thursday) at Official Receiver's Office, W. Africa House, 25 Water St., Liverpool, at 11 a.m. and 11.30 a.m.

Vale Electrical Co. Partnership between Stanley F. C. Eames and Joseph F. Upton trading at Elektron House, 18 Vale Drive, Barnet, dissolved as from Oct. 8. Debts received and paid by S. F. C. Eames.

BANKRUPTCY ACTS

Application for Discharge

Brentford. Basil F. Robbings, trading at Electric House at 1388 Greenford Rd., Greenford Green, and Radio and Electric House at 81b Northolt Rd., S. Harrow. Hearing will be at the Court House, Half Acre, Brentford, on Dec. 12, at 10.30 a.m.

Appointment of Trustee

Windsor. Henry M. Pullen, trading as Thames Side Electrical Services at 51 Thames St., Staines. Trustee is N. W. Osborne, C.A., 11-12 Finsbury Sq., London E.C.2.

Dividends

Birmingham. Richard H. Myers, trading as T. Myers and Son, gas and electrical engineers, at 169 Aston Rd., Birmingham. First and final dividends of 8s. 10¾d. in £ payable at 126 Colmore Row, Birmingham, on Nov. 22.

Release of Trustee

Gt. Grimsby. John V. Depledge, electrical contractor trading at 108 Frodingham Rd., Scunthorpe. Trustee was L. F. McCulloch, C.A., 26 South St. Mary's Gate, Grimsby.

BUSINESS PROSPECTS

HOME

Acton (Middlx.). Plans approved for erection of block of 25 flats in Ashfield Road.

Ashby (Leic.) U.D.C. Layout plans approved for 32 houses on Moira Rd. Estate.

Bridlington. Plans approved for further 99 houses on Westhill estate.

Bromley T.C. Erection of 107 houses in Hayes Place estate. Borough Engineer, Municipal Offices.

Burnley T.C. Construction of 52 dwellings on New Palace House estate. Borough Engineer and Surveyor, 22-24 Nicholas Street.

Castle Donington (Leics.) R.D.C. has approved erection of 220 houses in Park Lane.

Castle Ward R.D.C. Permission received to build 100 houses at Ponteland. Surveyor, North Rd., Ponteland.

Clitheroe (Lancs.) T.C. Erection of 36 bungalows at Henthorne. Borough Surveyor, Town Hall.

Consett U.D.C. Layout plans approved for 140 houses in Gloucester Road. Architect is J. J. Eltringham, Denvant St., Blackhill.

Coventry. It is proposed to build some 1,600 houses next year.

Doncaster. Approval granted to plans for proposed Hawthorn (Cantley) infants' school, estimated to cost £35,951. It is also proposed to spend £650 on installing electricity in flats in Wheatley Lane. New block estimated to cost £35,000 proposed for Percy Jackson grammar school.

Durham R.D.C. Loan sanction of £56,080 sought for erection of 48 houses at Framwellgate Moor, and of £18,830 for 16 houses at Bearpark. Plans approved also for 16 houses on Carrville estate.

Eastry (Kent) R.D.C. Following houses to be built: 30 at Aylsham, 12 at Eyethorne, and eight at Ash.

Faversham (Kent) T.C. Erection of 50 houses at North Preston. Borough Surveyor, Municipal Offices.

Felling U.D.C. It is intended to go ahead as soon as possible with installation of electricity in houses on Stoneygate estate.

Glasgow. Erection of 36 flats at Milton and 16 at Barlanark. Director of Housing, 20 Trongate.

Halesowen T.C. Tenders will probably be invited soon for erection of 48 houses on Howley Grange estate and 12 at Cradley.

Harrow U.D.C. Erection of 35 dwellings on Antoneys site, Pinner. J. H. Melville Richards, Engineer and Surveyor, Council Offices, Stanmore.

Hoole (Chester) U.D.C. Construction of 32 houses on Hoole House estate. Council's Architect, R. Boot, 22 Newgate St., Chester.

Huntingdon T.C. Sixty-eight houses to be built on American Lane estate subject to approval being granted.

Lincoln. Erection of 114 flats and maisonnettes on Riseholme estate. City Architect, Stamp End.

Pembroke T.C. Proposed fire station is to be sited at Bush Camp.

Newbury T.C. Tenders likely to be invited soon for installation of electricity in 308 houses.

Norfolk. Next year's school building programme includes Swaffham secondary (£121,800); Marham junior and infant (£50,000); and Downham Market secondary (£97,000).

Oban (Argyll) T.C. Approval granted for erection of 60 houses on Dunollie estate for Scottish Special Housing Association.

Peterborough. Forty flats and 60 houses are to be built on Dogsthorpe North estate.

Plymouth. Application to be made for sanction to borrow £140,477 for erection of Penlee secondary school.

Scunthorpe T.C. Thirty-six flats and 78 houses to be built on New Brumby estate.

S. Cambridgeshire R.D.C. is to build 262 houses on various sites next year.

South Shields. £15,000 is to be allocated for provision of outpatients' dept. at Ingham Infirmary.

Shoreditch B.C. Development of Hobbs Place area is likely to include erection of two six-storey blocks of 84 dwellings.

South Westmorland R.D.C. Construction of 56 dwellings at Staveley. Middleton and Jones, Architects, 1 Queen St., Lancaster.

Stretford (Lancs.). Plans in hand for construction of 57 flats in Milton Rd. and 24 in Edge Lane.

Surrey. Next year's school building programme has been approved. Among the larger projects are: Hoo secondary school, £132,000; Archers Court secondary school, £132,000; Dartford technical girls' school, £100,000; secondary school at Esher, £95,000; and Southborough secondary school, £95,455.

Thornaby-on-Tees. Plans prepared for extension of general offices in Trafalgar St. for Head, Wrightson and Co., Ltd.

Tyrone. Three schools are to be built at Dungann and Fintona at estimated costs of £20,900, £144,000 and £30,000.

Welton R.D.C. Erection of 36 houses at Fiskerton. Wm. Saunders and Partners, Architects, 24 Castle Gate, Newark-on-Trent.

West Kesteven (Lincs.). Plans for next year's building programme comprise some 186 houses on various sites. Largest groups are at Gt. Gonerby (50) and Long Bennington (40).

Wicklow. Rathdown Board of Assistance considering plans for erection of nurses' home, etc., at St. Columcille's Hospital, Loughlinstown. Estimated cost, £70,000.

Woolwich. L.C.C. proposes to establish primary school in Abbey Wood area. It is also proposed to erect 84 dwellings at Myrtledene Road.

Worcestershire. Construction of secondary school in Studley Rd., Redditch. L. C. Lomas, County Architect, 14 Castle Street, Worcester.

Worksop. Negotiations in hand for erection of 50 houses and 20 bungalows at Kingsway, and 6 houses at Waverley Place.

Worthing. Preliminary plans approved for prototype secondary school on Field Place estate. Estimated cost £197,846.

York. Tenders may be invited soon for erection of 182 houses on Chapel Fields estate.

OVERSEAS

Canada. Humble Manufacturing Co., Ltd., 1695 West Second Ave., Vancouver, wish to contact U.K. suppliers of rotary converters. They are interested in those with d.c. input of 6 V 12 V, and 32 V, and a.c. output of 110-115 V 50-60 c/s, all to deliver 250 W.

MEETINGS TO NOTE

THURSDAY, NOV. 20

INCORP. PLANT ENGRS. (Blackburn Branch).—"Care and Maintenance of Diesel Equipment." J. W. Armstrong. Chamber of Commerce, Richmond Terrace, 7.30 p.m.

I.E.S. (Gloucester and Cheltenham Centre).—"Lighting in Relation to Safety and Vision." E. W. Murray. G.E.C., 2 St. Aldate St., Gloucester, 6.15 p.m.

I.E.E. (London—Utilisation Section).—"Electricity in Farm Crop-Drying." C. A. Cameron Brown and P. G. Finn-Kelcey. Savoy Place, W.C.2, 5.30 p.m.

I.E.E. (Irish Branch).—"Condensers and Power Factor Improvement." J. J. Morrissey, Trinity College, Dublin, 6 p.m.

A.S.E.E. (Kent Branch).—"Principles underlying I.E.E. Wiring Regulations." J. J. Looker. Royal Star Hotel, Maidstone, 8 p.m.

A.S.E.E. (Liverpool Branch).—"Fluorescent Lighting and Dimming Control." Dr. Ballin. Elect. Service Centre, 9 Whitechapel, 7.30 p.m.

FRIDAY, NOV. 21

INSTN. OF MECHANICAL ENGRS.—"Recent Developments in Machinability of Steel." K. J. B. Wolfe. Storey's Gate, S.W.1, 5.30 p.m.

INSTN. OF HEATING AND VENTILATING ENGRS. (Birmingham).—Annual dinner at Midland Hotel.

INCORP. PLANT ENGRS. (E. Lancs. Branch).—Annual dinner at Grand Hotel, Manchester.

I.E.E. (N. Staffs. sub-centre).—Annual dance at Crown Hotel, Stone, 8 p.m.

ELECT. TRADE'S COMMERCIAL TRAVELLERS' ASSOC. Annual meeting at the Feathers Hotel, S.W.1, 5.45 p.m.

MONDAY, NOV. 24

A.S.E.E. (Bournemouth Branch).—"Formation of Ducts in Concrete Non-expendable Material." Grand Hotel, Firvale Rd., 8.15 p.m.

I.E.S. (Leeds Centre).—"Brightness Engineering." W. Robinson. L.S.B., 24 Aire St., 6.15 p.m.

I.E.S. (Leicester Centre).—"Black Light." H. L. Privett. E. Midlands Board Offices, Charles St., 6.30 p.m.

I.E.E. (London Radio Section).—"Recent Progress in Radar Duplexers." P. O. Hawkins. Savoy Place, W.C.2, 5.30 p.m.

I.E.E. (N.E. Centre).—"Use of Electricity in Modern Iron and Steel Works." W. F. Cartwright. Neville Hall, Westgate Rd., Newcastle, 6.15 p.m.

I.E.E. (N.W. Centre).—Faraday lecture on "Light from Dark Ages or Evolution of Electricity Supply." A. R. Cooper. Manchester Free Trade Hall, 7 p.m.

I.E.E. (N. Lancs. sub-centre).—"Logical Approach to Problems of Electric Space-Warming." D. H. Parry. Castle St., Kendal, 7 p.m.

I.E.E. (S. Midland Radio Group).—"Radio Astronomy." K. D. Machin. James Watt Memorial Inst., Gt. Charles St., Birmingham, 6 p.m.

I.E.E. (Western Utilisation Group).—"Inherent Current Voltage and Speed Control in Dynamo-Electric Machinery." J. C. Macfarlane, J. W. Macfarlane, and W. I. Macfarlane. Elect. House, Colston Ave., Bristol, 6 p.m.

TUESDAY, NOV. 25

A.S.E.E. (York Branch).—"Production and Application of Toughened Glass." P. M. Davidson. Creamery Restaurant, The Pavement, 7.30 p.m.

INSTN. OF HEATING AND VENTILATING ENGRS. (S.W. Branch).—"Impact of Environmental Warmth on Personnel in Industry." F. R. L. White. G.E.C., Cathays Park, Cardiff, 6.30 p.m.

I.E.E. (London Students Section).—"Measurement of Very Small Direct Currents." M. W. Jarvis. Savoy Place, W.C.2, 7 p.m.

I.E.S. (Cardiff Centre).—"Lighting of Modern Ocean Liners." T. Catten. Elect. Board Offices, 5.45 p.m.

I.E.E. (N. Midland Utilisation Group).—"Logical Approach to Problems of Electric Space-Warming." B.E.A. Offices, Whitehall Rd., Leeds, 6.30 p.m.

I.E.E. (N.W. Measurements Group).—"Voltage Transformers and Current Transformers associated with Switchgear." W. Gray and A. Wright. Engineers' Club, Albert Sq., Manchester, 6.15 p.m.

E.A.W.—Conference on Fuel Situation at I.E.E., Savoy Place, W.C.2, 2.30 p.m.

WEDNESDAY, NOV. 26

A.S.E.E. (Luton Branch).—"A Camera and the Engineer." G. E. Whalley. George Hotel, 8 p.m.

ENGINEERS' GUILD (W. Midland Branch). Address by Maj. A. H. S. Waters at Imperial Hotel, Birmingham, 6.45 p.m.

I.E.S. (London).—Discussion on "Home Lighting." 2 Savoy Hill, W.C.2, 6 p.m.

I.E.S. (Swansea Group).—"Lighting of Modern Ocean Liners." T. Catten. Minor Hall, Y.M.C.A., 6 p.m.

I.E.E. (London Supply and Measurements Sections).—"Electrolytic Analogue in Design of H.V. Power Transformers.' D. McDonald; also "Accurate Mapping of Electric Fields with Electrolytic Tank." K. F. Sander and J. G. Yates. Savoy Place, W.C.2, 5.30 p.m.

I.E.E. (N.W. Radio Group).—"Radio Telemetering." E. D. Whitehead and J. Walsh. Engineer's Club, Albert Sq., Manchester, 6.30 p.m.

I.E.E. (S. Midland Centre).—"Measurement of Electrical Activity in Human Body." J. C. Shaw. Winter Gardens Restaurant, Malvern, 7.15 p.m.

THURSDAY, NOV. 27

I.E.S. (Birmingham Centre).—"Lighting of Docks and Railway Marshalling Yards." W. T. F. Souter. Regent House, St. Philip's Place, Colmore Row, 6 p.m.

FRIDAY, NOV. 28

INST. OF WELDING (N. London Branch).—First annual dinner at Holborn Restaurant, London, 6.45 p.m.

MANCHESTER ASSOC. OF ENGRS.—"Economic Review." A. Elliott. Engineers Club, Albert Sq., 6.45 p.m.

INCORP. PLANT ENGRS. (Birmingham Branch).—Ladies' evening. "Domestic Use of Fuel." J. Nixon.

INCORP. PLANT ENGRS. (Peterborough Branch).—Annual dinner.

I.E.S. (Swansea Group).—Annual supper dance.

I.E.E. (Swansea sub-centre).—Annual dinner and dance and visit of President. Langland Bay Hotel, 7 p.m.

SATURDAY, NOV. 29

I.E.E. (N. Lancs sub-centre).—Dinner dance at Cliffs Hotel. Blackpool, 6.30 p.m.

EXHIBITION DIARY

Cycle and Motor Cycle Show opened at Earls Court, London, on Nov. 15 and closes on Nov. 22.

London Medical Exbn. 35th show at New Horticultural Hall closes on Nov. 21.

National Poultry Show opens at Olympia, London, today and closes on Nov. 22.

Smithfield Show and Agric. Machinery Exbn. opens at Olympia, London, on Dec. 8, continuing until Dec. 12.

TRADE MARKS

This information is extracted from the Official Journal by permission of the Controller.

Thornycroft. 693,014. Class 7. Engines and motors, electricity generators and sugar making machinery. John I. Thornycroft and Co., Ltd., Thornycroft Hse., Smith Sq., S.W.1.

Tyana. 708,559. Class 9. Electric soldering irons and parts thereof. R. E. Pickstone Ltd., 56/60 Islington Park St., N.1.

Unicorn. 709,951. Class 9. Loudspeakers. Trix Electrical Co., Ltd., 1-5, Maple Place, Tottenham Court Rd., W.1.

Victor Safety Iron. 706,985. Class 9. Electric flat irons. Bylock Electric, Ltd., 109 South St., Ponders End, Middx.

Valbachrome. 700,725. Class 11. Electric light fittings, etc. Valbania Ltd., Cavendish Engineering Works, Hartington, S.W.8.

Welec. 705,600. Class 9. Insulated electric cables, electricity conductors, conduits and conduit fittings, etc. Frank Westerman (Wholesale) Ltd., 94 Dale End, Birmingham 4.

The GEORGE Cinema
(G.P. Associated Cinemas)
Bellshill, Glasgow

LENNOX D. PATERSON, F.R.I.B.A.
Architect

BELLSHILL'S new cinema...

is claimed as the first of its kind to be built since the war, and in the words of the Architect "embodies all that is new in the cinema world." The excellent electrical services which are provided include two pleasing and practical ideas, the electrically operated portcullis across the entrance, and the superb lighting of the proscenium. For this first class cinema installation Messrs. Martins the electrical contractors decided with confidence to "let Henley Cables carry the current."

HENLEY CABLES

Electrical Contractors:
W. C. MARTIN & CO., LTD.,
10 West Campbell Street,
GLASGOW, C.2.

BY APPOINTMENT ELECTRIC CABLE MANUFACTURERS

W. T. HENLEY'S TELEGRAPH WORKS CO. LTD., 51-53 HATTON GARDEN, LONDON, E.C.1

CONTACTOR SWITCHGEAR LTD
WOLVERHAMPTON
ENGLAND.
A name identified
with high achievement
in the field of
Automatic Contactor
Control Gear

CLASSIFIED ADVERTISEMENTS

OFFICIAL TENDERS AND APPOINTMENTS

WORK WANTED WANTED · FOR SALE

Those wishing to advertise in these pages should send the text to the Classified Advertisement Dept., Electrical Times, Sardinia House, Sardinia Street, London W.C.2, before 10 a.m. on TUESDAY of week of issue. Official Displayed Advertisements are charged at 42s. per inch, and all other classified advertisements at 3s. per line. Situations Wanted will be published four times for twice the single insertion rate. Fee for Box No. and postage on replies is 2s.

TENDERS INVITED

BOROUGH OF WIDNES

STREET LIGHTING

TENDERS are invited for the SUPPLY, ERECTION and FIXING of 1·21 miles of street lighting to conform to the general requirements of the Ministry of Transport Departmental Committee's Final Report on Street Lighting, in particular to the lighting of traffic roads (Group A).

Plans and General Conditions of Contract may be seen and copies of the Specification, Form of Tender and Schedule of Prices obtained on application to the Borough Engineer and Surveyor, Town Hall, Widnes.

Tenders are to be addressed to the Town Clerk, Town Hall, Widnes, and delivered to his office not later than first post on Thursday, December 11, 1952, enclosed in the envelope provided, endorsed "Tender for Street Lighting."

FRANK HOWARTH,
Town Clerk.

Town Hall, Widnes.
November, 1952. (B 566)

COUNTY COUNCIL OF THE WEST RIDING OF YORKSHIRE

TENDERS are invited for the RENEWAL of the ELECTRICAL INSTALLATION at the undermentioned Schools:—

1. GOOLE GRAMMAR SCHOOL.
2. HONLEY C.E. SCHOOL.

Specifications with plans, together with conditions of tender, may be obtained on application to the County Architect, "Bishopgarth," Westfield Road, Wakefield, on payment of a deposit of £2 2s., which will be returned on receipt of a bona-fide tender. Cheques must be made payable to the "West Riding Treasurer" and crossed "& Co."

Sealed Tenders must be addressed to me, the undersigned, and received at Room 3, County Hall, Wakefield, not later than 10 a.m. on Monday, December 8, 1952.

BERNARD KENYON,
Clerk of the County Council.

November, 1952. (B 567)

BOROUGH OF BROMLEY

STREET LIGHTING IMPROVEMENT SCHEME
(Section No. 1)

TENDERS are invited for the IMPROVEMENT of street lighting in London Road, High Street and Masons Hill, for a length of approximately 1½ miles, the work to include dismantling of existing tungsten lighting, moving and re-siting existing 25 ft. steel tubular columns, supplying and fixing approximately 100 fluorescent street lanterns (Group A) with associated equipment and wiring.

Contractors wishing to tender should apply for Bills of Quantities, Form of Tender and Drawings, not later than Tuesday, December 2, 1952, to the Borough Engineer, Municipal Offices, Bromley, Kent, enclosing a deposit of £2 2s. which will be refunded on receipt of a bona fide tender, not subsequently withdrawn.

Tenders in plain sealed envelopes marked "Tender —Street Lighting" must be delivered to the undersigned not later than noon on December 16, 1952.

The Council does not bind itself to accept the lowest or any tender.

S. CRITCHLEY AUTY,
Town Clerk.

Municipal Offices,
Bromley, Kent.
November 17, 1952. (B 612)

APPOINTMENTS VACANT

Engagement of persons must be made through a Local Labour Office or Scheduled Employment Agency, if the applicant is a man aged 18-64, or a woman aged 18-59; unless the person concerned is excepted or the employment is in a managerial or professional capacity, or is otherwise excepted from the provisions of the Notification of Vacancies Order, 1952.

BRITISH ELECTRICITY AUTHORITY

Eastern Division

APPLICATIONS are invited for the following superannuable positions. Salary and conditions of service will be in accordance with the National Joint Board Agreement:—

DEPUTY POWER STATION SUPERINTENDENT
Norwich Generating Station

Salary Class "F," Grade 3, £887-£925 per annum.

Applicants should have had considerable practical experience in the operation, maintenance and administration of a generating station, and should preferably be Corporate Members of one of the recognised Engineering Institutions.

The successful applicant will be expected to reside within a reasonable distance of the generating station.

STATION SHIFT CONTROL ENGINEER
Norwich Generating Station

Salary Class "F," Grade 10, £557-£578 per annum.

Applicants should have reached the standard of Ordinary National Certificate in Electrical Engineering or its equivalent, have experience in the operation of a switchboard at a generating station and be fully conversant with high-voltage switching operations and protective systems.

SHIFT CHARGE ENGINEER
Rye House Generating Station

Salary Class "G," Grade 7, £704-£733 per annum.

Applicants should preferably have served an apprenticeship and obtained a recognised qualification in electrical or mechanical engineering and possess experience in the operation of a generating station fired with pulverised fuel.

Applications, stating age, details of qualifications and experience, should be addressed to the Divisional Controller, British Electricity Authority, Eastern Division, Northmet House, Southgate, N.14, to arrive not later than November 29, 1952.

W. N. C. CLINCH,
Controller.
(B 572)

SOUTH EAST SCOTLAND ELECTRICITY BOARD

THE BOARD invite applications for the position of GENERAL ASSISTANT ENGINEER in the Commercial Department at Area Board Headquarters.

Applicants should have had a good general and technical education and previous experience in the commercial activities of an electricity supply undertaking would be a recommendation. The salary will be in accordance with the National Joint Board revised agreement, Grade 8, Class "AX/BX," and will commence at a point within the range of £481 to £636 depending upon qualifications and experience. The appointment is superannuable.

Applications, giving full details of training qualifications, experience, age, present appointment and salary, should be submitted to the Chief Commercial Officer, South East Scotland Electricity Board, 52 Melville Street, Edinburgh, within fourteen days.

THOMAS J. MULLAN,
Secretary.

52 Melville Street,
Edinburgh 3. (B 583)

NORTH WESTERN ELECTRICITY BOARD

APPOINTMENT OF
SERVICE CENTRE SUPERVISOR (MALE)
Bolton Service Centre

APPLICANTS should be of good personality, capable of organising and taking charge of a Service Centre, experienced in the control of sales staff, and have a comprehensive knowledge of electrical appliances, tariffs, display and sales development. Possession of the E.D.A. Salesmanship Certificate will be considered an advantage.

Salary scale, £580-£640 p.a. N.J.C. conditions.

Applications to Sub-Area Manager, No. 2 Sub-Area, The North Western Electricity Board, National Buildings, St. Mary's Parsonage, Manchester 3, by November 29, 1952.

APPOINTMENT OF
SECOND ASSISTANT DISTRICT COMMERCIAL ENGINEER
Rossendale District

Duties will include control and supervision of industrial and domestic contract wiring, preparation of specifications and installation, repair and maintenance of appliances on consumers' premises. Preference given to applicants who are Associate Members of the I.E.E.

Salary scale, £629-£660 p.a. Grade E.7. N.J.B. conditions.

APPOINTMENT OF DEMONSTRATOR (FEMALE)
Burnley District

Applicants should be experienced in demonstrating electrical appliances and should hold an E.A.W. Certificate in Electrical Housecraft, or be prepared to take an approved course of study leading to the possession of such a certificate.

Salary scale, £380-£470 p.a. N.J.C. conditions. Progression beyond £420 will be subject to a certificate that the person appointed is capable of undertaking all the duties of the grade.

Applications for the above appointments to Sub-Area Manager, No. 5 Sub-Area, The North Western Electricity Board, Jubilee Street, Blackburn, by November 29, 1952.

APPOINTMENT OF
GENERAL ASSISTANT ENGINEERS,
MAINS DEPARTMENT
Whitehaven and Carlisle Districts

Applicants should be experienced in all types of rural and urban distribution work up to 11 kV. Preference will be given to holders of H.N.C. in Electrical Engineering.

Salary scales: Whitehaven District, £528-£545 p.a., Grade F.11; Carlisle District, £504-£521 p.a., Grade E.11. N.J.B. conditions.

Applications to Sub-Area Manager, No. 6 Sub-Area, The North Western Electricity Board, Castle Green, Kendal, by November 29, 1952. (B 580)

COUNTY BOROUGH OF DONCASTER

Works Department

APPLICATIONS are invited for the position of ELECTRICAL ASSISTANT in the above Department at a salary in accordance with Grade A.P.T. 5 (a) of the National Scales of Salaries (£625 rising to £685).

Candidates must have had practical experience of domestic and industrial installation work and be capable of preparing estimates and specifications and supervising the carrying out of electrical installations and maintenance work in municipal buildings, works, schools and new housing schemes.

Candidates should also have had experience of street lighting work, and will be responsible, under the Borough Surveyor, for works of installation and maintenance of street lighting, both electricity and gas.

Education standard should be equivalent to matriculation and applicants should possess the Higher National Certificate in Electrical Engineering.

Written applications, stating age, education, qualifications and full details of experience, accompanied by copies of two recent testimonials and disclosing in their application whether to their knowledge they are related to any member of, or the holder of any senior office of, the Council, should reach the undersigned not later than December 6, 1952.

H. R. WORMALD,
Town Clerk.

Town Clerk's Office,
1 Priory Place,
Doncaster.
November 10, 1952. (B 562)

BRITISH ELECTRICITY AUTHORITY

South Wales Division

APPLICATIONS are invited for the superannuable appointment of ASSISTANT SHIFT CHARGE ENGINEER, Cardiff Power Station. Salary N.J.B. F9 (£587 to £609 per annum). Applicants should preferably have obtained H.N.C. and served a regular apprenticeship. Experience in a modern generating station essential.

Application forms obtainable from Div. Secretary, British Electricity Authority, South Wales Division, Cardiff (Pengam Moors) Airport, Cardiff, should be returned by November 28, 1952. (B 585)

BRITISH ELECTRICITY AUTHORITY

South Western Division

THREE GENERAL ASSISTANT ENGINEERS required in the Technical Department.

Superannuation Scheme. Salary N.J.B. Class "AX/CX," Grade 8, £481-£655.

All candidates should possess qualifications leading to A.M.I.E.E., and have had experience in a leading electrical manufacturer's works.

Two of the vacancies are in the General Technical Section, one located at Bristol, and one at Plymouth. Duties will include commissioning and maintenance of protective and control equipment at Generating and Transmission Stations. Interest in protective gear design, generator and switchgear testing and fault current calculations essential.

The third vacancy is in the Meter Section at Bristol. Duties will include repair and calibration of tariff and operation metering equipment and special tests of electrical equipment at Generating and Transmission Stations.

Application forms obtainable from the Divisional Secretary, 26 Oakfield Road, Bristol 8, to be returned not later than December 1, 1952. (B 568)

CROWN AGENTS FOR THE COLONIES

ELECTRICAL FITTER required by the Government of Tanganyika for the Public Works Department for one tour of two to three years in the first instance. Salary in scale £787 rising to £1,100 (including temporary allowance). Outfit allowance £30. Free passages. Liberal leave on full salary. Candidates, between 28 and 40 years of age, must have served a regular apprenticeship in electrical engineering and have had subsequent experience in the operation and maintenance of diesel power stations up to 1,000 kW capacity and of industrial electrical power installations.

Apply at once, by letter, stating age, full names in block letters, and full particulars of qualifications and experience, and mentioning this paper, to the Crown Agents for the Colonies, 4 Millbank, London S.W.1, quoting on letter M.29683/B. The Crown Agents cannot undertake to acknowledge all applications and will communicate only with applicants selected for further consideration. (B 611)

NORTH WESTERN ELECTRICITY BOARD

APPOINTMENT OF
SUB-AREA CONSUMERS' ENGINEER
No. 6 (Lakeland) Sub-area

APPLICANTS should have held a responsible post within the Electricity Supply Industry and should preferably be Corporate Members of the I.E.E.

Duties include the supervision of all commercial activities in the Sub-Area. A wide knowledge of rural electrification is essential.

The salary will be in accordance with the decision (not yet announced) of the appropriate negotiating body. The commencing salary will be not less than £1,375 p.a.

Applications, stating age, experience, qualifications, present post and salary, etc., to Establishment Officer, The North Western Electricity Board, Cheetwood Road, Manchester 8, by November 29, 1952. (B 579)

SOUTHERN ELECTRICITY BOARD

SENIOR SHOWROOM ATTENDANT

SALISBURY District of No. 4 (Bournemouth) Sub-Area. Salary, N.J.C. Grade 3 (£520 to £580 per annum). N.J.C. conditions of service.

Applicants should have experience in all showroom duties and a sound knowledge of domestic apparatus, sales procedure, application of tariffs and consumer service.

The successful candidate will be required to contribute to the B.E.A. and Area Boards' Superannuation Scheme, if eligible.

Applications on forms obtainable from the Sub-Area Secretary, 1 Priory Road, Bournemouth, and returned to him in envelopes endorsed "Senior Showroom Attendant," not later than December 1, 1952. (B 590)

SOUTH WALES ELECTRICITY BOARD

REQUIRED, DISTRICT COMMERCIAL MANAGER, District 462 (Newport), in the Eastern Sub-Area of the Board.

Applicants must have had experience in the application of electricity in all its branches; negotiation of supplies, public lighting, and contracting.

Salary in accordance with Class "F," Grade 3 (£887 to £906 to £925) of the N.J.B. Schedule.

Applications stating age, present position and salary, qualifications and experience, and giving three referees to be addressed to the Secretary to arrive by November 29, 1952.

D. G. DODDS,
Secretary.

St. Mellons,
Cardiff. (B 595)

MERSEYSIDE AND NORTH WALES ELECTRICITY BOARD

SENIOR ASSISTANT (CONSUMERS' ACCOUNTS)

APPLICATIONS are invited for the appointment of Senior Assistant (Consumers' Accounts) to be directly responsible to the Superintendent in charge of Income Accounting in the No. 2 Sub-Area Accountant's Department, Eversley, Frodsham, Cheshire. Salary within range £840 to £700 per annum (N.J.C. Grade 5).

The work involves control of staff engaged on consumers' accounting, including meter reading and collection, billing and relative statistics. Experience of such work in a public utility undertaking or a sales ledger office is desirable.

The appointment is superannuable and subject to medical examination.

Applications, stating age, experience and qualifications, should be addressed to the Manager, No. 2 Sub-Area, Electricity House, Sandiway, near Northwich, quoting reference 84A. Closing date, November 28, 1952. (B 594)

BRITISH ELECTRICITY AUTHORITY

Midlands Division

FIRST ASSISTANT STATION CHEMIST required at Walsall Generating Station. N.J.B. service conditions, superannuable appointment, salary within Schedule "A," Grade G9, commencing at £621 per annum.

Applicants should preferably hold a university degree or A.R.I.C., but consideration will be given to those holding the Higher National Certificate and studying for A.R.I.C. or an equivalent qualification. A thorough knowledge of and practical experience in fuel, water and oil analyses, coal sampling and water treatment and other chemical services required in modern power stations is essential.

Application forms are available from the Establishments Officer, 53 Wake Green Road, Moseley, Birmingham 13, to be completed and returned by December 6, 1952.

F. W. LAWTON,
Divisional Controller.
(B 578)

CIVIL SERVICE COMMISSION, DUBLIN

POSITIONS VACANT

ASSISTANT ENGINEERS (7) in the Department of Posts and Telegraphs. Salary scales (approx.): Man, £483-£890; Woman, £483-£708 (higher initial salary in certain circumstances). Age limits: 21-35 with extensions of the upper limit in certain cases.

Applications are invited from persons who fulfil the requirements of the Regulations and (a) hold a recognised University Degree in Engineering (which must include a technical electrical engineering subject) or in Science subjects (which must include Experimental Physics), or (b) have passed or are registered as having obtained exemption from the Institution examination of the Institution of Electrical Engineers. Regulations and further particulars may be obtained from the Secretary, 45 Upper O'Connell Street, Dublin.

Latest time for accepting completed application forms: 5 p.m. on December 12, 1952. (B 569)

MIDLANDS ELECTRICITY BOARD

GENERAL ASSISTANT ENGINEER required at Board H.Q. The successful applicant will be required to assist in the design and construction of heavy and light mechanical and electrical plant assembled in the Board's workshops. Applicants should have received a good general and technical education and a thorough training in modern drawing office and machine shop practice.

Commencing salary within the range £481 to £619 per annum, ultimately rising to £674 per annum. (N.J.B. Schedule "C," Grade 8, "AX/DX.").

Apply in writing within 14 days to the Secretary (FWC), Midlands Electricity Board, Mucklow Hill, Halesowen, near Birmingham.

A. STEPHENS,
Secretary.
(B 592)

SOUTH EASTERN ELECTRICITY BOARD

THIRD ASSISTANT DISTRICT ENGINEER

Croydon District

SALARY £587 to £609 per annum, plus London Weighting under N.J.B. F.9. Superannuable. Applicants should be suitably qualified and have practical experience in E.H.V. and L.V. 3 phase and 1 phase distribution.

Applications, giving 2 referees, on forms obtainable from H. Lowe, M.I.E.E., District Manager, SEEBoard, Electric House, Wellesley Road, Croydon, to be returned to him by December 3, 1952.

A. L. BURNELL,
Secretary.
November 14, 1952. (B 597)

BRITISH ELECTRICITY AUTHORITY

East Midlands Division

APPLICATIONS are invited for the following post in the Construction Department of this Division:

SECOND ASSISTANT ENGINEER (ELECTRICAL)

Staff Vacancy No. 100/52.

Applicants should hold a degree in electrical engineering, be Corporate Members of the Institution of Electrical Engineers, or possess other equivalent qualifications.

They should have had experience in the design and installation of turbo-alternators, switchgear, transformers and cables up to 33 kV, and other electrical equipment associated with modern power stations.

Experience in the preparation of specifications and estimates is essential.

Salary will be within Schedule "C," Class "AX/DX," Grade 2 (£809 to £1,028 per annum) of the National Joint Board Agreement.

The post will be pensionable within the provisions of the Authority's Superannuation Scheme.

Applications should be submitted on the official form which may be obtained from the Divisional Establishments Officer, British Electricity Authority, Barker Gate, Nottingham, and returned, not later than December 8, 1952, to the undersigned. Please quote vacancy number.

FIRST ASSISTANT ENGINEER

Generation Operation. Staff Vacancy No. 102/52

Applications are invited from suitably qualified engineers for the above position on the staff of the Generation Engineer (Operation), Northern Group, located at Nottingham, or Generation Engineer (Operation) Southern Group, located at Leicester.

Appropriate technical qualifications to at least Higher National Certificate standard are desirable, and applicants should have served a recognised engineering apprenticeship. Experience subsequent to training must include power station operation and maintenance, preferably in a responsible position.

Salary will be in accordance with N.J.B. Agreement, Schedule "C," Class "AX," Grade 1 (£945 to £1,078 per annum).

The post will be pensionable within the provisions of the B.E.A. and Area Board's Superannuation Scheme.

Applications should be submitted on the official form which may be obtained from the Divisional Establishments Officer, British Electricity Authority, Barker Gate, Nottingham, and should be returned to the undersigned not later than December 8, 1952. Please quote Vacancy No. 102 when applying for application form.

L. F. JEFFREY,
Divisional Controller.
(B 598)

EASTERN ELECTRICITY BOARD

Fens Sub-Area

APPOINTMENT OF DEMONSTRATOR—CAMBRIDGE

APPLICATIONS are invited for the appointment of Demonstrator in the Cambridge District of the Fens Sub-Area.

Candidates should have had domestic science training, including electrical housecraft, and should preferably hold the E.A.W. Certificate. They should be competent to plan and give cookery demonstrations, including lectures and advice to consumers in the utilisation of domestic electrical appliances. Previous experience in an Electricity Service Centre is desirable.

The salary for the appointment will be in accordance with Grade 1 (£380 p.a. by £20 to £460 p.a. by £10 to £470 p.a.) of the National Joint Council Salary Agreement, although progress beyond £420 p.a. will be subject to a certificate that the person concerned is capable of undertaking all the duties of the grade. Both future salary and conditions of service will be in accordance with agreements made from time to time by the appropriate negotiating bodies.

The successful candidate will be required to contribute to a superannuation scheme and may be required to undergo a medical examination.

Applications, by letter, stating age, education, qualifications and experience, with details of present appointment and salary, should be submitted to the Manager, Cambridge District, Eastern Electricity Board, 4 Market Hill, Cambridge, within fourteen days of the appearance of this advertisement. (B 591)

BRITISH ELECTRICITY AUTHORITY

North Western Division

VACANCY No. 822. SENIOR ASSISTANT ENGINEER (MECHANICAL), No. 3 Sub-Division, Manchester. Salary £945 to £1,173 (N.J.B. AX/DK, Grade 1). Candidates should preferably hold an engineering degree or be members of the Institution of Mechanical Engineers, and must have had wide experience in the operation and maintenance of power station plant.

Apply, quoting vacancy number, to Establishments Officer, British Electricity House, 825 Wilmslow Road, Manchester 20, not later than November 29, 1952. (B 582)

BRITISH ELECTRICITY AUTHORITY

London Division

APPLICATIONS are invited for the following superannuable posts. Salary, including London Allowance, and conditions of service in accordance with N.J.B. Agreement.

SHIFT CHARGE ENGINEER
Fulham Generating Station

Technical qualifications up to Higher National Certificate standard including thermo-dynamics as a subject, together with a good general education is required. Considerable experience in operation of modern power station essential. Character and ability to deal with staff problems important. Salary, Schedule "A," Class "L," Grade 7, £946 1s. p.a.

ASSISTANT TO MAINTENANCE ENGINEER (ELECTRICAL)
Fulham Generating Station

Qualifications: Extensive electrical maintenance experience, preferably in a large modern power station. Applicants should possess the Higher National Certificate and should have served an electrical engineering apprenticeship with a reputable manufacturer. Supervisory ability is essential. Salary, Schedule "A," Class "L," Grade 11, £731 17s. p.a.

GENERAL ASSISTANT ENGINEER
(Efficiency and Testing) Group 2 H.Q.

Qualifications: Good technical education and experience of the testing and/or operation of the mechanical plant in a power station. Salary, Schedule "C," Class "AX," Grade 8, £506 to £649 19s. p.a. Ultimate maximum, Class "Ex," £728 14s. p.a.

Applications must be made on the form obtainable from Divisional Secretary, B.E.A. London Division, Generation House, Great Portland Street, W.1, and be received within 14 days of this advertisement. (B 599)

YORKSHIRE ELECTRICITY BOARD

APPLICATIONS are invited for the following appointment:—

Area Board Headquarters,
Chief Engineer's Department

SECOND ASSISTANT ENGINEER (SYSTEM DESIGN)

Applicants should have a sound technical education and preferably a university degree in electrical engineering. Experience in the layout, construction and operation of distribution systems and in the preparation of technical reports is also desirable.

Salary, N.J.B. Agreement Schedule C,AX-DX 2, £809 to £945 per annum, rising to £1,028.

Applications, giving full details of age, qualifications, and experience, should be forwarded to the Secretary, Yorkshire Electricity Board, Wetherby Road, Scarcroft, Leeds, not later than December 4, 1952. (B 581)

SOUTH WALES ELECTRICITY BOARD

REQUIRED, FIRST ASSISTANT to DISTRICT COMMERCIAL MANAGER, District 104 (Lampeter), in the Western Sub-Area of the Board.

Applicants must have had experience in the application of electricity to domestic premises, commercial premises, farms and public lighting.

Salary in accordance with Class "A," Grade 5 (£542 to £563 to £583) of the N.J.B. Schedule.

Applications stating age, present position and salary, qualifications and experience, and giving three referees to be addressed to the Secretary to arrive by November 29, 1952.

D. G. DODDS,
Secretary.

St. Mellons,
Cardiff. (B 596)

BRITISH ELECTRICITY AUTHORITY

North Western Division

VACANCY No. 820—STATION SUPERINTENDENT, Bury Generating Station, Lancs. Salary, £997 to £1,040 (N.J.B. E.1).

Apply, quoting vacancy number, to Establishments Officer, British Electricity House, 825 Wilmslow Road, Manchester 20, before November 29, 1952. (B 584)

BRITISH ELECTRICITY AUTHORITY

Merseyside and North Wales Division

STATION SHIFT CONTROL ENGINEER required for the Bromborough Power Station, Cheshire. Salary, £621 to £648 per annum, Class "H," Grade 10, N.J.B.

Forms of application from the Divisional Secretary, Beaconsfield Road, Woolton, Liverpool. Closing date November 29, 1952. (B 593)

ARMATURE WINDER to take charge and develop established repair shop. Good salary and opportunity.—Priory Electric Service (Coventry) Ltd., 3 Lower Ford Street, Coventry. (B 601)

POWER STATION SHIFT CONTROL ENGINEERS

wanted for the Margam Works of the Steel Company of Wales Limited. Applicants must have advanced technical education and experience in the control of an interconnected boiler or turbine operation would be an advantage.

The salary for this position, which is pensionable, is according to age and experience.

Applications in own handwriting should be addressed to:

The Personnel Superintendent
THE STEEL COMPANY OF WALES LTD.
P.O. Box No. 3, PORT TALBOT

and be received not later than November 24, 1952. (B 547p)

ARMATURE WINDERS and FITTERS with repair shop experience. Top rates, 5-day week, bonus, all holidays paid, etc.—The Lewis Electric Company, Moor Works, Blackamoor Lane, Maidenhead, Berkshire. (B 571)

ASSISTANT ENGINEERS experienced in the survey and construction of overhead transmission lines in Scotland, mainly wood pole types.—Details of age, education, experience and salary to Box No. 850, Keith and Co., Advertising Agents, Edinburgh. (B 526)

BRATT COLBRAN, LIMITED invite applications for the position of MANAGER for their Electrical Department. First-class administrative ability and sales connections in the Industry essential; knowledge of design and development of new appliances an especial advantage.—Write in first instance to General Sales Manager, Bratt Colbran, Limited, 10 Mortimer Street, London W.1. (B 618)

CAPABLE POWER STATION MAINTENANCE ENGINEER required for service in British West Indies, age 35 to 40. Must have first-class knowledge of diesel electric maintenance, operation and testing. Candidates would be expected to carry out complete overhauls to various types of diesel electric generating plants. The present capacity of the station is approximately 5,000 kW, but additions are being made thereto. Candidates should be of good personality, be socially acceptable and, if married, this qualification applies to wives also. A knowledge of high and low tension electrical equipment is essential and candidates should be able to control and instruct local maintenance and operating staff. Salary (including bonus) £960 per annum, plus furnished quarters. Passage paid.—Applications, giving full particulars of education, training and experience, to Box No. 2203, Electrical Times. (B 600)

DISTRIBUTION ENGINEER required for service in the British West Indies.

Applicants should not be less than 35 years of age should have had a public school education and must be corporate members of the Institution of Electrical Engineers.

Applicants must have at least ten years experience in overhead and underground distribution systems up to 11 kV, and must be capable of administering a supply system, including consumer agreements and tariff settlements.

The post will carry a salary (including bonus) of £1,500 per annum, and furnished quarters will be provided and the company will pay for air or sea passage for the selected candidate.

Three months leave, on full pay, together with passage to this country, will be granted on completion of each three years of service.

Applications, giving full particulars of education, training and experience to Box No. 2171, Electrical Times. (B 480)

ELECTRICAL ASSISTANTS of British Nationality and British Parentage, required to design schemes and to prepare drawings for internal services in buildings, and low tension underground and surface line systems. Victoria location. Salary £350 to £700 according to experience.—Box No. 2213, Electrical Times. (B 616)

BOX No. replies to be addressed to the ELECTRICAL TIMES, Sardinia House, Sardinia Street, London W.C.2

ENGINEER MANAGER required with experience in the layout of new works for production of batch and mass-produced articles connected with electrical industry. Applicants should have had similar experience, where modern methods have been employed for machining and assembly and able to produce satisfactory results essential. Only those capable of commanding a substantial salary need apply for the post which is permanent and pensionable.—Full details of experience and age should be sent in confidence to Box No. 2215, Electrical Times. (B 617)

EWBANK AND PARTNERS LIMITED have vacancies for the following:—
MECHANICAL ENGINEERING DRAUGHTSMEN experienced in Power Station design and layout, pipework layout, circulating water systems, with a knowledge of coal and ash handling plants.
ELECTRICAL ENGINEERING DRAUGHTSMEN experienced in Power Station and substation distribution systems.
The positions are permanent and are pensionable. Free lunches are provided and a five-day week is in operation.—Applicants should write in the first instance, stating age, details of experience and salary required, to The Secretary, Ewbank and Partners, Limited, Engineering Consultants, 10/11 Grosvenor Place, London, S.W.1. (B 519)

JUNIOR ASSISTANT ENGINEER required in estimating dept. by Electrical Contractors in London S.W.1 area, experience necessary.—Write details, age and salary required, Box No. 2217, Electrical Times. (B 619)

LINESMEN/ERECTORS, fully experienced on steel tower lines, required for Tilbury/Elstree contract.—Apply: Eve Construction, 208 Green Lanes, Palmers Green, London N.13. (B 570)

MECHANICAL MAINTENANCE ENGINEER wanted for large industrial power plant equipped with h.p. water-tube boilers, turbines and modern auxiliaries. Applicants must have some years practical experience with this type of power plant backed up with technical knowledge up to H.N.C. standard or its equivalent. Age not less than 32 or more than 45. Non-contributory pension scheme. Commencing salary £840. Position offers good prospects for a suitable man.—Reply to Box No. 2183, Electrical Times. Quote Ref. TME/3. (B 531)

POWER Circuit Breaker Development. Excellent opportunities and good salaries are offered to DESIGNERS who can undertake this work. First-class conditions in a modern factory situated in the north-west, and equipped with all laboratory apparatus necessary for the development of new ideas. Assistance will be given to successful candidates who are married to secure housing accommodation.—Write, stating qualifications, experience and present occupation, to Box No. 2191, Electrical Times, quoting reference AJDH. (B 554)

REPRESENTATIVE required by E.W.F. Wholesaler for the N.W. Lancs. coastal area. Wage, commission and expenses. Must be car owner and be prepared to reside in the territory. Applications to be accompanied by copies of recent references.—Address: Box No. 2219, Electrical Times. (B 620)

REVO ELECTRIC COMPANY, LTD., Tipton, Staffs., requires an ENGINEER for Industrial Laboratory. Duties include Prototype Testing, Design and Development work on an extensive range of electrical appliances. Wide technical qualifications and previous practical experience essential.—Reply, giving age, salary required, and full particulars, to the "Cashier". (B 573)

THE NATIONAL BOILER AND GENERAL INSURANCE CO. LTD., St. Mary's Parsonage, Manchester 3, requires ENGINEERS for appointment as Inspecting Engineers of (a) Boilers and Engines (b) Lifts and Cranes, and (c) Electrical Plant. First-class M.o.T. Certificate of Competency, and/or Higher National Certificate (Mechanical or Electrical), full apprenticeship and practical experience necessary.—Apply, in own handwriting, giving age (limits 26 to 33), training and experience, academic qualifications and copies of testimonials. Salary up to £755 per annum. Non-contributory pension scheme. (B 563)

ELECTRICAL DESIGNER DRAUGHTSMEN
REQUIRED FOR
London office of large consulting engineers. Qualifications are H.N.C. (preferred) or equivalent and 3 years' experience on layout and design of power and lighting schemes for large engineering projects. These appointments carry sickness, pension and life assurance benefits and above average salaries will be offered to capable men.—Applications in writing, detailing qualifications and experience, to:
Box No. 2211, ELECTRICAL TIMES.
(B 615p)

THE GENERAL ELECTRIC COMPANY LIMITED
WITTON, BIRMINGHAM
requires Winders for turbo-alternators and large a.c. and d.c. machines. High level earnings and good shop conditions; pension scheme. Housing assistance will be given in approved cases. Apply by letter, giving full details of experience, to:—
The Labour Manager,
THE GENERAL ELECTRIC COMPANY LIMITED
Electric Avenue, Witton, Birmingham 6 (B 555p)

APPOINTMENTS FILLED

BOX No. 2063. The position of ASST. ENGINEER has now been filled, and all applicants are thanked. (B 574)

APPOINTMENTS WANTED

CABLE and Wire Manufacture. Branch Manager, South Wales and West England territory (32), requires situation. Sales representation/clerical experience. Electrical knowledge. Current licensed driver. Six years cable industry.—Box No. 2181, Electrical Times. (B 520)

FOREMAN ELECTRICIAN, single, 31, requires interesting and responsible post. No degrees but good theoretical knowledge. Hard working and conscientious. Overseas or U.K., Ex-R.A.F. wireless mech. —Box No. 2209, Electrical Times. (B 613)

FOREMAN ELECTRICIAN, 30, requires change, Southern England, or would consider abroad. Expd. installation and maintenance, motors, starters, switchgear, all types, sizes, voltages; all wiring systems. Good education.—Box No. 2205, Electrical Times. (B 602)

WANTED

A.C.-D.C. MOTORS, STARTERS, complete change-over installations, etc.—A.A. Electrical Co., Ltd., 67 Rothschild Road, Chiswick Park, W.4. Tel.: Chiswick 5105. (A 11)

MOTORS. Wanted to purchase. D.C. Motors and Generators as fitted to Coles Cranes. Incomplete machines considered.—Box No. 2189, Electrical Times. (B 551)

SURPLUS STEEL STOCKS wanted. Strips, bars, sheets, etc.—Details to Morleys (Birmingham), Ltd., Regina Works, Alcester Street, Birmingham 12. (A 203)

WANTED, D.C. and A.C. ball-bearing MOTORS, MOTOR GENERATOR SETS, DYNAMOS and ALTERNATORS.—Full details to Britannia Manufacturing Co., Ltd., 22-26 Britannia Walk, London, N.1. (A 7)

WANTED for prompt cash, ferrous and non-ferrous SCRAP; also plant for dismantling. Buyers of secondhand machinery and plant for re-use.—W. and H. Cooper, Ltd., 176 Brady Street, Bethnal Green, E.1. (A 1)

WANTED. Large quantity of 4-in. outside diameter TUBES from the dismantling of old Babcock Water-tube boilers. Best prices paid. Prepared to purchase Babcock and Wilcox Water-tube boilers for dismantling. —Apply, giving full details, to Midland Iron and Hardware Co., Cradley Heath, Staffs. (A 3)

WANTED, ROTARY CONVERTORS, any size.—Universal, 221 City Road, London E.C.1. (A 9)

WANTED to purchase. Established ELECTRICAL BUSINESS, preferably West London. Small basic staff of first-class mechanics far more important than present turnover.—Box No. 2207, Electrical Times. (B 603)

WORK WANTED

CAPACITY AVAILABLE
REPETITION WORK
ON INDEX AUTOMATICS
We have immediate Capacity Available for Production of Screws, Nuts, Bolts and Turned Parts up to 1½ in. diameter.
F. R. MOUNT AND SONS, LTD.
Between Streets, Cobham, Surrey.
Tel.: Cobham (Sy.) 3301. (B 622p)

A. C. and d.c. MOTOR REWINDS and REPAIRS. Prompt service, fully guaranteed. Edgware 5566 (4 lines). —Service Electric Co., Ltd., Stanmore, Middx. (A 19)

BRASS LIGHTING FITTINGS, cleaned and gilded. Crystal chandeliers repaired and cleaned. Outside lanterns gilded and waterproofed.—Arts and Antiques, 49 Berwick Street, London W.1. (B 393)

CASTINGS. Fisher Foundries Ltd., Great, Birmingham, have capacity for brass, gunmetal and soft grey iron machine moulded repetition castings weighing 1-30 lb. Loose pattern work up to 3 cwt. Delivery by road to all parts. Tel.: B'ham, Victoria 0197. (A 647)

ELECTRIC motors, stators, etc., REPAIRED AND REWOUND. Vacuum cleaner and electric tools rewound. Seven-day service.—Motor Winding Co., 18 Gipsy Hill, London S.E.19 (Gipsy Hill 0354). (B 575)

PRESSINGS. Assemblies, wire work, spot and arc welding, capstan work. Quick service. Large quantities material available. Quotations by return. Specialists in sub-contract work.—Mountsorrel Pressings, 20 Loughborough Road, Mountsorrel. (B 273)

AGENCIES

FLUORESCENT TUBE refilling specialists require AGENTS in Yorks, Tyneside, Lincoln, Northampton, Suffolk, Devon and West Wales. Must have facilities for the storing and distribution of tubes.—Qualpron (Elect.), 43 Crawford St., Glasgow W.1. (B 614)

FOR SALE

GENERATING PLANT

FOR DISPOSAL: 300 h.p. Weir Sulzer ENGINE and ALTERNATOR available after January 1, 1953, and can be seen by appointment and for which offers are invited.—G. A. Harvey and Co., Ltd., Greenwich Metal Works, London S.E.7. (B 621)

GENERATING PLANT for sale.—One 500 kW B.T.H. ROTARY-CONVERTER, 11 kV, 450-490 V, 1,068 amps d.c. Complete with the following equipment:

One h.t. 11 kV O.C.B., G.E.G. One 500 kW, B.E.T. TRANSFORMER. One Rotary STARTING PANEL.

One d.c. PANEL comprising of D.P., A.C.B., 1,200 amps, Field Rheostat, Ammeter, Voltmeter and K.W.H. Meter, the d.c. equipment is mounted on polished black slate.

This machine is in perfect working order and can be inspected under full running conditions, by appointment at Backhouse and Coppock, Ltd., Sutton Mills, Macclesfield. (B 534)

ENGINEERING PLANT & MATERIALS

CONDUIT Ex-stock against Licence or S.Q.E. Certificate, close joint or welded, also CONDUIT FITTINGS, CABLE, etc.—Bertford Manufacturing and Supply Company, Marklands Works, Horwich, Lancs. Tel.: Bolton 8093. (B 605)

FOR DISPOSAL, approximately 100,000 5/16 in. Whitworth Double Coil SPRING WASHERS, mostly non-interlocking type. Offers.—Box No. 2199, Electrical Times. (B 576)

FOR SALE, 6,000 feet of M.S. Ventilation Tubing, 23 in. diameter, in 9 ft or 12 ft lengths with flanged ends. In practically new condition. Immediate delivery. —Apply, The Cementation Co., Ltd., Lowgill, Bentham, nr. Lancaster (Tel. Bentham 357). (B 604)

WE supply BALL BEARINGS and STEEL WASHERS. —Cecil Farms Ltd., 53 Tottenham Court Road, London W.1. (B 610)

FOR SALE, Richards Goliath No. 3 KEY-SEATING MACHINE (internal); motorised, 400/440 V a.c.—Can be inspected at Jones Bros., Esmor Works, Rhosesmor, Mold. (B 624)

750,000

NEW BALL RACES, ROLLER, THRUST AND TIMKEN RACES IN STOCK. STOCK LISTS AVAILABLE.

CLAUDE RYE BEARINGS

895-921 Fulham Road, London, S.W.6
RENown 6174 (20 lines) (B 274p)

DOMESTIC APPLIANCES

GRUBB IMMERSION HEATERS. The new 7 kW model. No purchase tax. Provision for intermediate loadings as required. All lengths 16 in. to 30 in. Immediate delivery.—Write for particulars and terms to distributors, John Owner and Co., Ltd., Springfield Road, Birmingham 13. Tel.: Springfield 2939. (B 25)

LIGHTING EQUIPMENT

COMPLETE private house LIGHTING PLANT, 50 V. Ruston-Hornsby petrol engine, 2 kW generator, 27 chloride cells. First-class condition. Can be seen working in Warwickshire.—Harold F. Ward, Ltd., 420 Stratford Road, Birmingham 11. (B 623)

FLUORESCENT FITTINGS complete with all control gear. Finished hard gloss white stove enamel. Fully guaranteed two years. 5 ft. Hexagon Batten S.B.5, 57s. 6d., 5 ft. Industrial Trough T.M.5, 63s., 4 ft. Slim Batten C.H.4, 48s. 6d. Also 2 ft. and 3 ft. All prices ex works. Illustrated catalogue and price list on request.—M.E.S., Ltd., 117 Hornsey Road, N.7. NORth 4923. (B 96)

PURLEY CHOKES AND BALLASTS. Our 80 W Tapped h.p.f. ballast, with starter switchgear-holder incorporated, is proving itself the most popular unit. Suitable for most fittings, 57s. 6d. each, subject.—F. W. Blanshard Ltd. (Dept. ET), Purley, Surrey. Uplands 4818-9. (A 20)

30,000 OSRAM BULBS, 24 V 3 W M.E.S. 15 m/m, New, suitable for Christmas Lighting Sets, etc. Price 7½d. each nett tax inclusive. (Ex M.o.S.).—Box No. 2201, Electrical Times. (B 577)

METERS

MERSEYSIDE AND NORTH WALES ELECTRICITY BOARD

No. 2 Sub-Area

SALES BY TENDER
SURPLUS METERS

THE MERSEYSIDE AND NORTH WALES ELECTRICITY BOARD invite TENDERS for Surplus Meters which can be inspected at the Electricity Works, Howley, Warrington, and the Electricity Works, Carlton Street, St. Helens, on any week-day except Saturday, between the hours of 9 a.m. and 5 p.m.

Forms of Tender can be obtained from me and completed Tenders must be sealed and endorsed "Tender for Surplus Meters," and delivered to Sandiway House, Nr. Northwich, Cheshire, not later than 12 o'clock noon on Monday December 8, 1952.

S. C. HARLING
Manager, No. 2 Sub-Area.

Sandiway House,
Nr. Northwich, Cheshire,
November 13, 1952. (B 606)

A. C./D.C. QUARTERLY and SLOT METERS. Brent Electrical Co., 6 Holmdale Gardens, London, N.W.4. (A 8)

HOUSE-SERVICE METERS, a.c. or d.c., quarterly or prepayment.—Universal Electrical, 221 City Road, London E.C.1. (A 14)

MOTORS & STARTERS

A. A. ELECTRICAL CO. FOR A.C./D.C. MOTORS, SWITCHGEAR, EXHAUST FANS, HOISTS, REDUCTION GEARS, new or reconditioned units.—Chiswick 5105, Chiswick 5605, 67 Rothschild Road, W.4. (A 10)

A. C. and D.C. MOTORS, all sizes, large stocks. Fully guaranteed.—Milo Engineering Works, Ltd., Milo Road, East Dulwich, S.E.22. (Forest Hill 2278-9.) (A 5)

A. C. MOTOR, 6 h.p. 200/250 1 phase, 50 cycles, 1,400 r.p.m. and starter, as new. 60 ft 5 in. belting 1¼ in. shafting and plumber blocks.—WIM 5629. (B 607)

All types and sizes of

Industrial Electrical Equipment

ELECTROPOWER COMPANY LIMITED
Kingsbury Works, Kingsbury Road, London, N.W.9
Telephone: COLindale 4621/2. (A 18p)

A.C. and D.C. MOTORS, GENERATORS, from stock.—Service Electric Co., Ltd., Honeypot Lane, Stanmore, Middx. Edgware 5568-9. (A 13)

A.C. and D.C. MOTORS, GENERATORS, SWITCHGEAR, etc., always in stock. Let me have your inquiries.—G. E. Whittaker, Wellington Mill, Bolton Road, Blackburn. Tel. 7322. (A 6)

ELECTRIC MOTORS for 400 V, 3-phase, 50 c/s. 300-h.p. auto synchronous L.D.M. MOTOR, open protected type on C.I. underbed, 600 r.p.m., with direct coupled exciter and Brookhirst control equipment.

225-h.p. S.R. MOTOR by B.T.H., 485 r.p.m., 292 amps. Protected type, 2 endshield R.O.B.

175-h.p. external S.R. MOTOR by B.T.H., 480 r.p.m. Protected type, 2 endshield R.O.B. Standard shaft ext.

150-h.p. 350-kVA synchronous induction MOTOR by Mather and Platt, 506 amps. 0.39 p.f., speed 750 r.p.m. With Brookhirst starter.

Two 120-h.p. external S.R. MOTORS by Met-Vick., 585 r.p.m. Screen protected type fitted drip proof cowls. Endshield B.R.B. Standard shaft ext. 8 in. by 4 in. dia.

100-h.p. external slipring MOTOR by Northumbria Motors. Protected type. Speed 485 r.p.m. With Ellison control gear. Extension fitted "V" rope pulley 22½ in. dia. by 10 in. for six 1¼ in. ropes.

100-h.p S.R. MOTOR by G.E.C., speed 725 r.p.m. Encl. ventilated, 2 endshield R.O.B. With Ellison starter.

100-h.p. auto synch. MOTOR by Crompton. 750 r.p.m. Complete with flange mounted exciter.

Three 95-h.p. Metro-Vick, slipring, totally encl. fan-cooled type. Shaft ext. 6 in. by 3 in. dia. Continuously rated.

85-h.p. S.R. MOTOR by Holmes, 485 r.p.m. Protected type, 2 endshield R.O.B. Standard shaft fitted pulley 16 in. dia. by 12 in. face. Cont. rated.

George Cohen, Sons, and Co., Ltd., Wood Lane, London, W.12. Tel.: Shepherds Bush 2070 and Stanningley, nr. Leeds. Tel.: Pudsey 2241. (B 586)

FOR ELECTRICAL MOTORS, GENERATORS, ALTERNATORS, SWITCHGEAR, please send your inquiries to Oldfield Engineering Co., Ltd., 96 East Ordsall Lane, Salford 5. (A 16)

FOR SALE. Various a.c. and d.c. MOTORS, new and reconditioned secondhand, surplus to our requirements. These include ten 20 h.p. 6 pole a.c. S.C.R. motors new; five 7½ h.p. ditto; twelve 2-speed change pole a.c. motors 5/2½ h.p. 4/8 pole, also new, all wound for 400/440 V 3 phase 50 cycles and offered at attractive prices. —Full details on application. The Newall Engineering Co., Ltd., Old Fletton, Peterborough. (B 549)

LARGE STOCK of portable tool and vac. replacement ARMATURES available. Non-standard lines quick delivery.—Gilbert Electrical Tool Services Ltd., 4 Clarence Street, Nottingham. (B 608)

OFFERS WANTED for the following: 10 little used 2 h.p. 460 V d.c. 950 r.p.m. Crompton Parkinson MOTORS, complete with STARTERS. 1 MOTOR GENERATOR SET with exciter, input 460 V, d.c., 5 h.p., 1,500 r.p.m., output 415 V, a.c., 3 phase, 50 cycles, 3·8 kVA. 250 14-in. Benjamin REFLECTORS, complete with lampholders.—Wardle and Davenport Ltd., Leek, Staffordshire. (B 609)

SWITCHGEAR

MERCURY SWITCHES are made by Hall Drysdale and Co., Ltd., of 58 Commerce Road, Wood Green, London N.22. Tel.: Bow 7221. (A 15)

UNCLASSIFIED

BATTERY AND CHARGING EQUIPMENT by the D.P. Battery Co., Ltd., including stand and panel, single phase 50 cycle input.—Apply for particulars: Chief Supplies Officer, Surrey County Council, 3 Palace Road, Kingston-on-Thames. Kingston 2111. (B 587)

MISCELLANEOUS

FREE! Brochure giving details of courses in ELECTRICAL ENGINEERING and ELECTRONICS, covering A.M.Brit.I.R.E., City and Guilds, etc. Train with the Postal Training College operated by an Industrial Organisation. Moderate fees.—E.M.I. Institutes, Postal Division, Dept. ET29, 43 Grove Park Road, London W.4. (Associate of H.M.V.) (A 305)

THE PROPRIETOR of British Patent No. 626068, entitled "IMPROVEMENTS IN OR RELATING TO AUTOMATICALLY CONTROLLED ELECTRICAL PUMPING UNITS," offers same for licence or otherwise to ensure practical working in Great Britain.—Inquiries to Singer, Stern and Carlberg, 14 E. Jackson Blvd., Chicago 4, Illinois, U.S.A. (B 589)

THE ASSOCIATION OF SUPERVISING ELECTRICAL ENGINEERS

54 Station Road, New Barnet, Herts.

SWANN DIPLOMA EXAMINATIONS

NOTICE IS HEREBY GIVEN that the Swann Diploma Examinations will be held at Centres on May 20 and 21, 1953.

Subjects: Electrical Installation Practice; Electrical Maintenance.

Application forms and copies of regulations and syllabus may be obtained from the General Secretary, the Association of Supervising Electrical Engineers, 54 Station Road, New Barnet, Herts.

The latest date for receipt of application forms is March 2, 1953.

G. DAVIDSON,
Assistant General Secretary.

October, 1952. (B 588)

CITY AND GUILDS (Electrical, etc.) on "No pass—No Fee" terms. Over 95% successes. For full details of modern courses in all branches of Electrical Technology, send for our 144-page handbook FREE and post free.—B.I.E.T. (Dept. 39), 17 Stratford Place, London W.1. (A 54)

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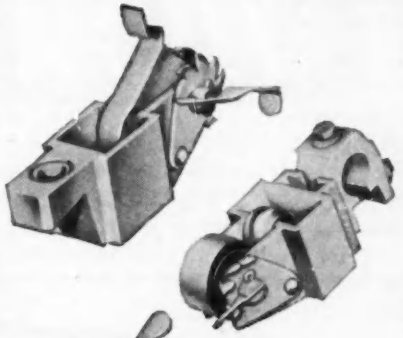

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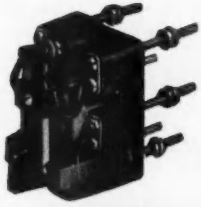

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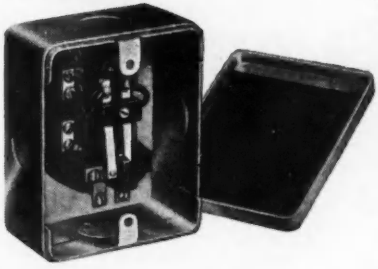

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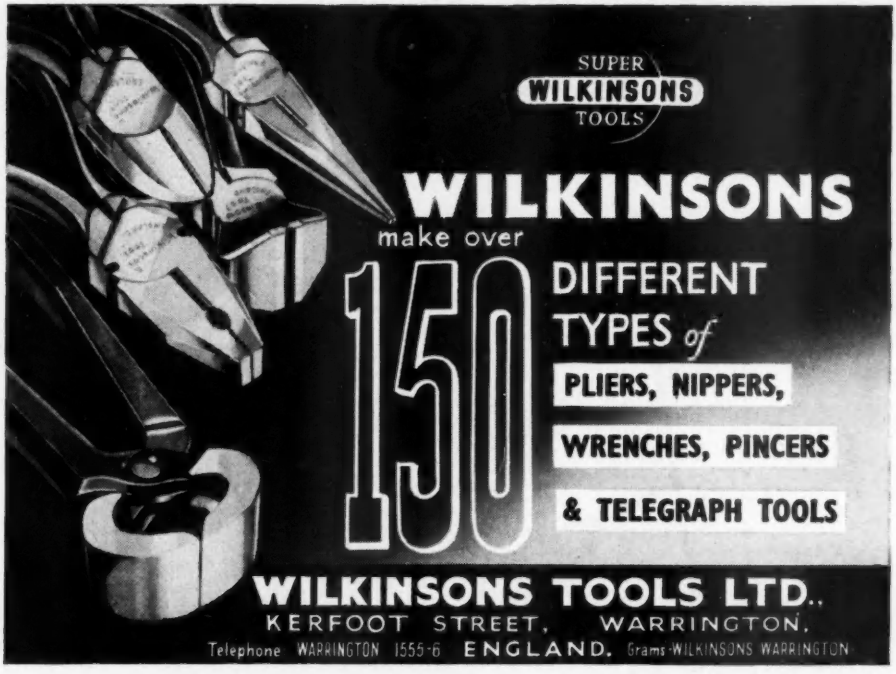

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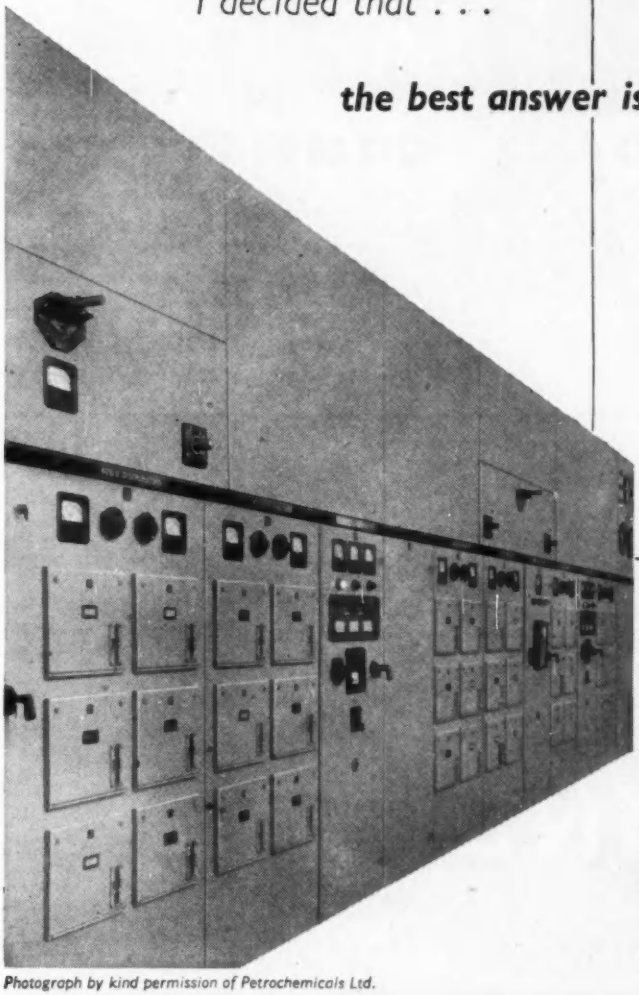

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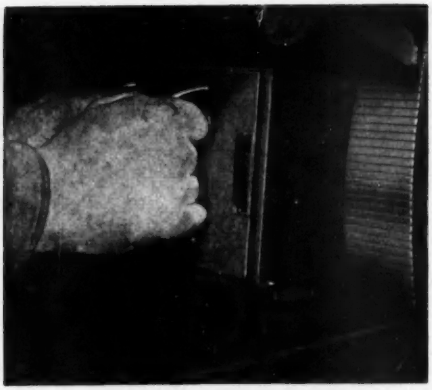

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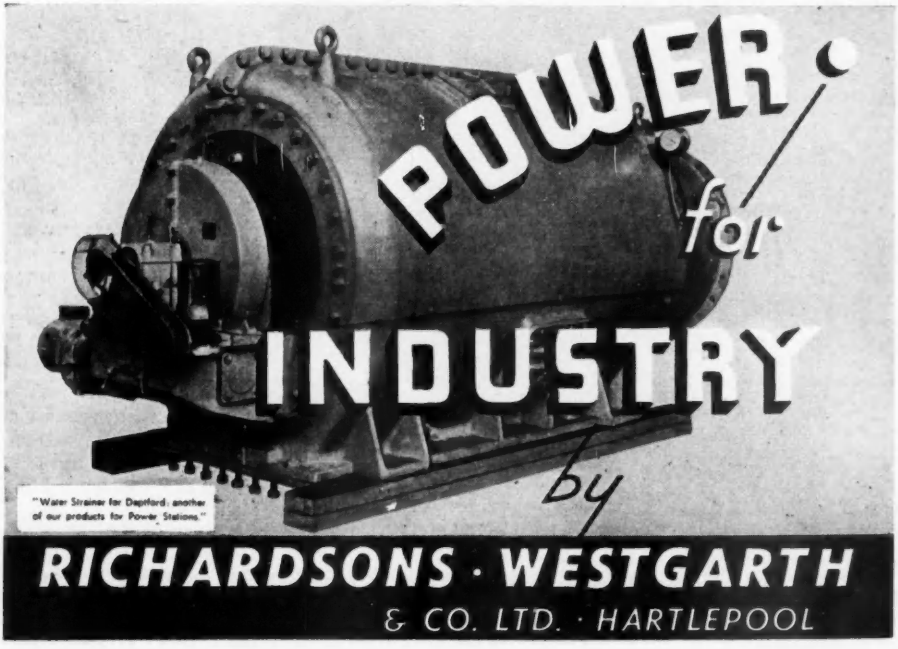

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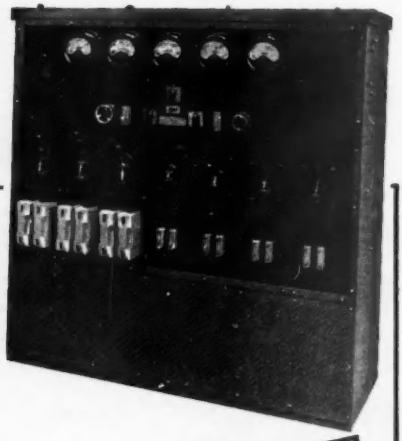

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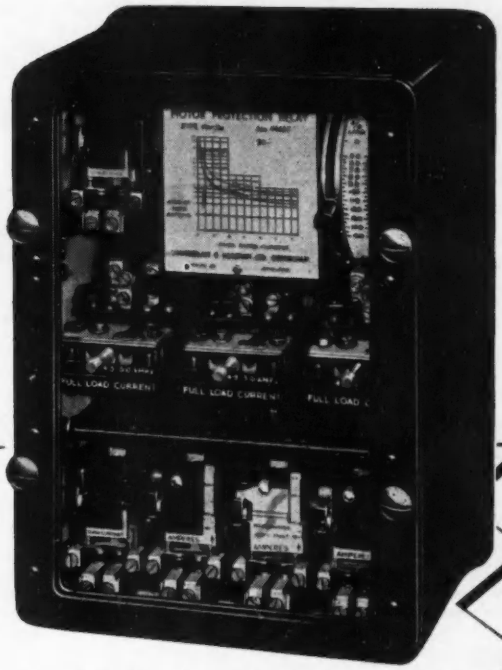
TYPES H, HST, HST/AM



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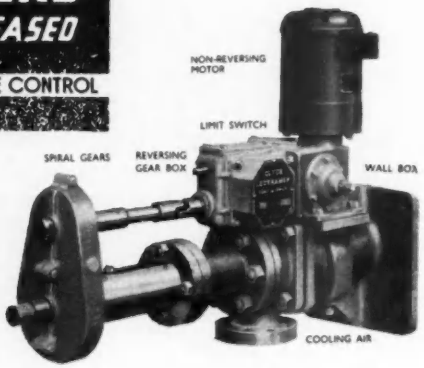

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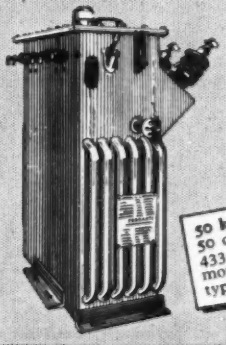
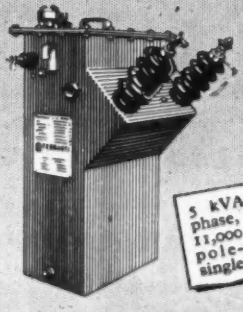
(Left) 500 kVA, 3 phase, 50 cycles, 11,000/433-250 volt substation transformer showing the normal tank fittings to British Electricity specification T.1.



50 kVA, 3 phase, 50 cycles, 11,000/433-250 volt, pole-mounted platform type.



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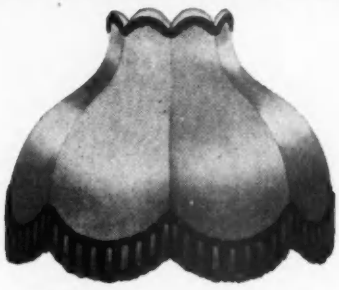

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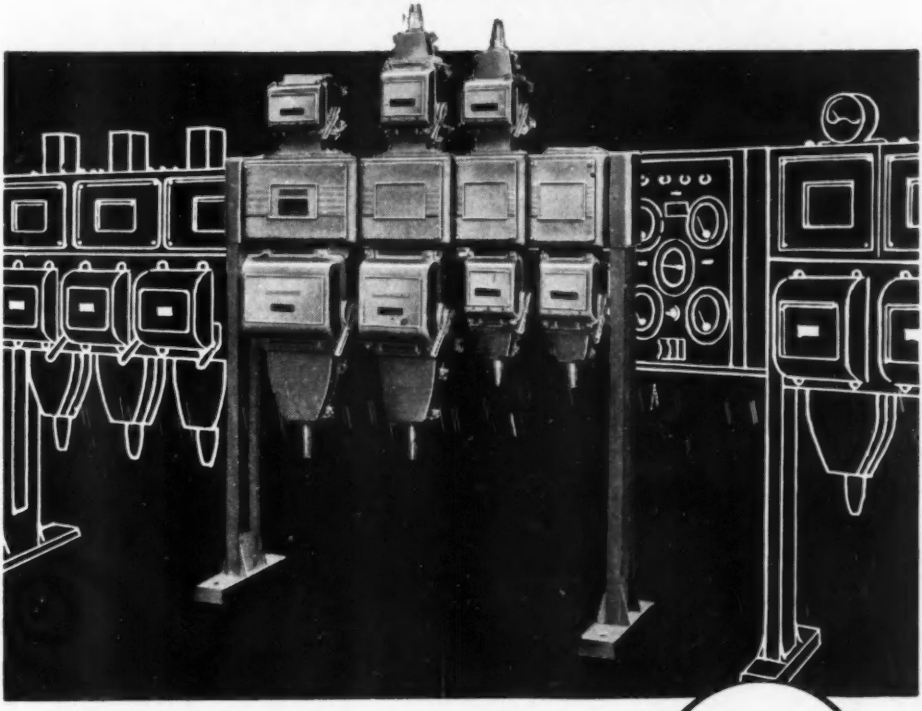

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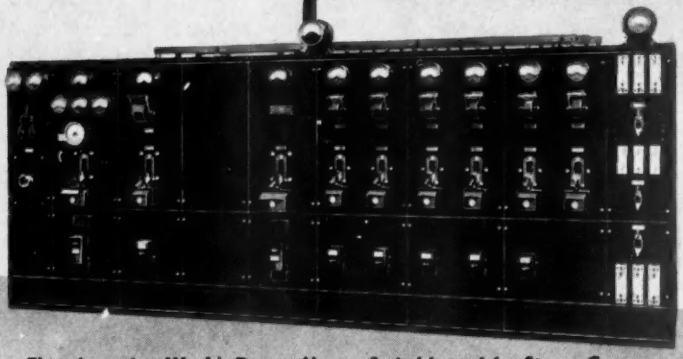

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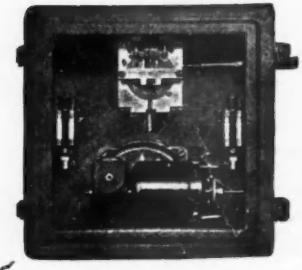

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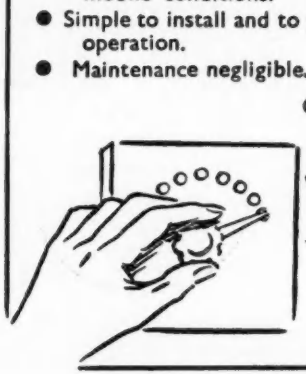

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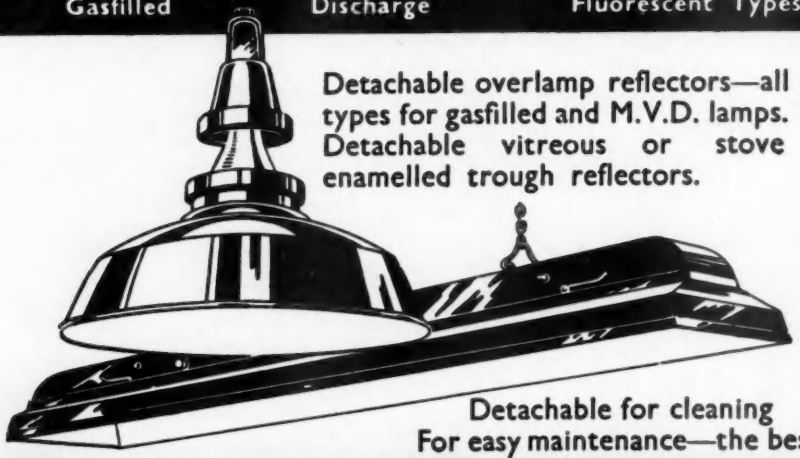

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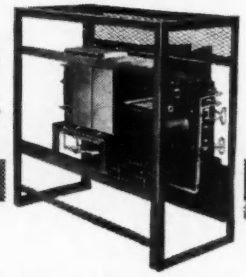

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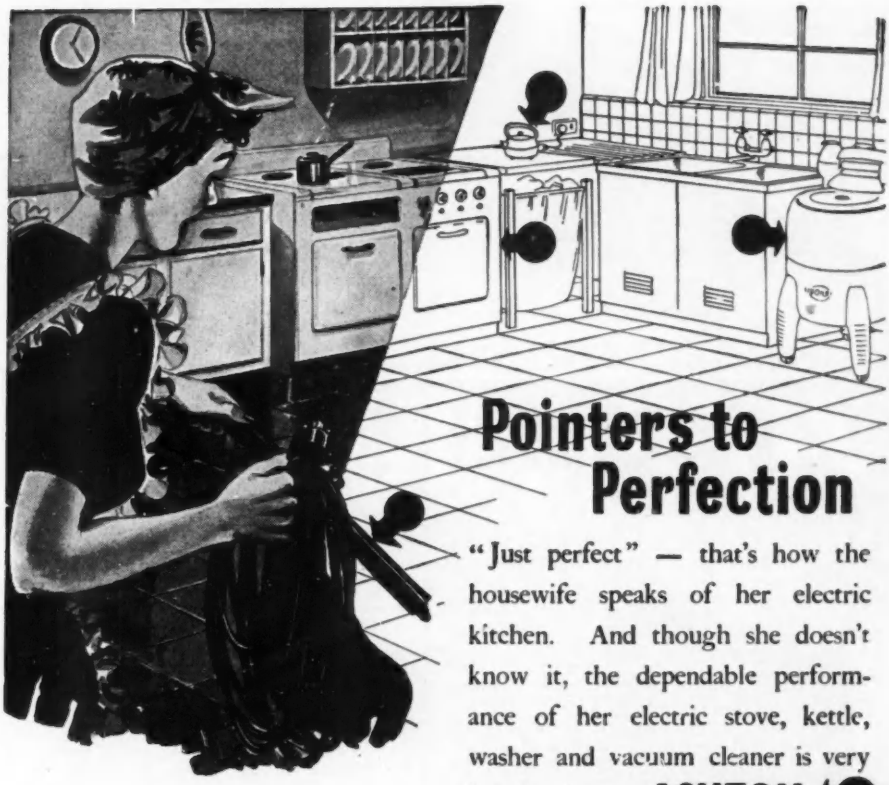

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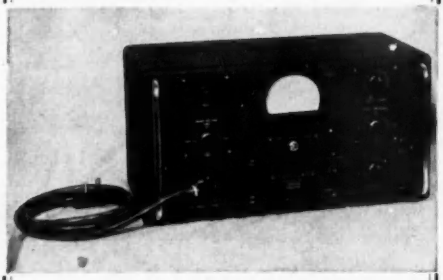

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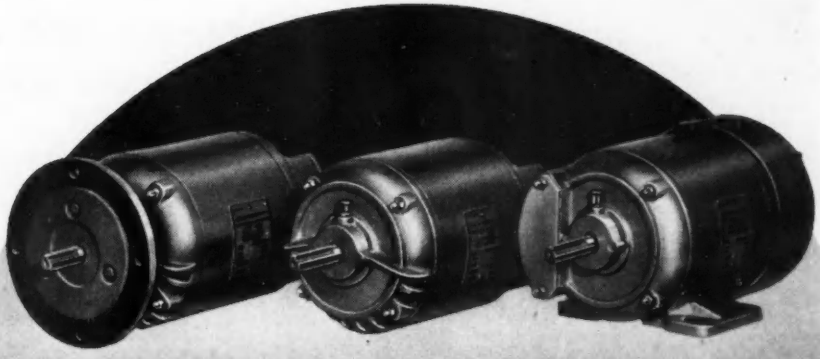

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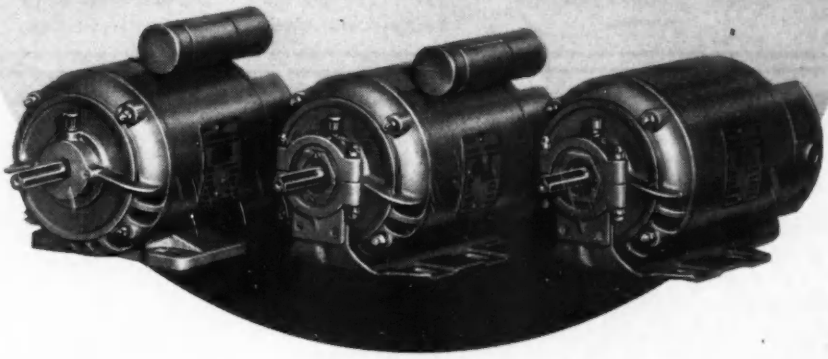

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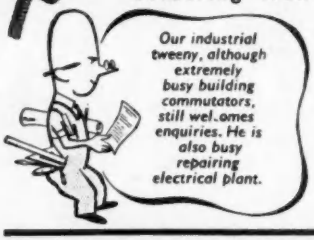
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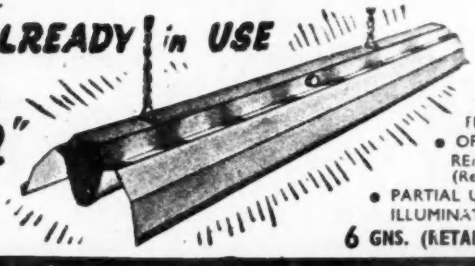

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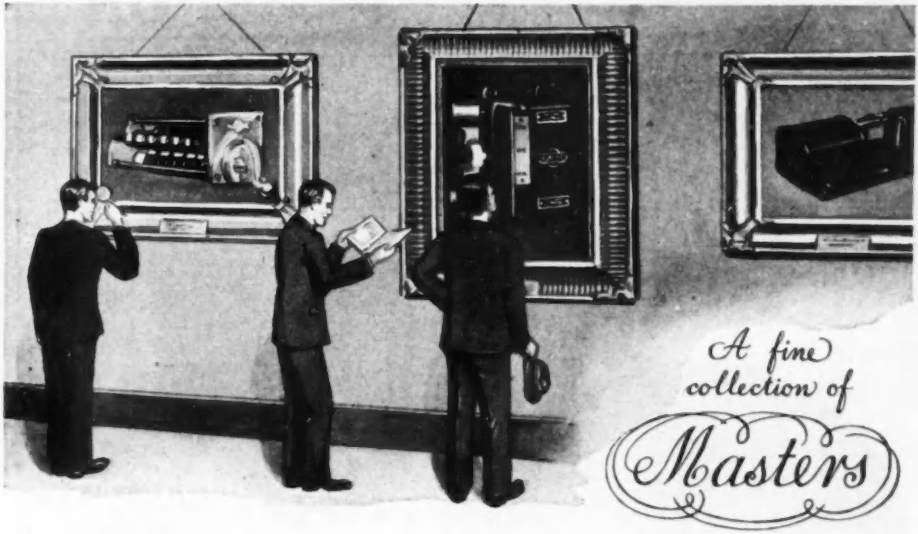

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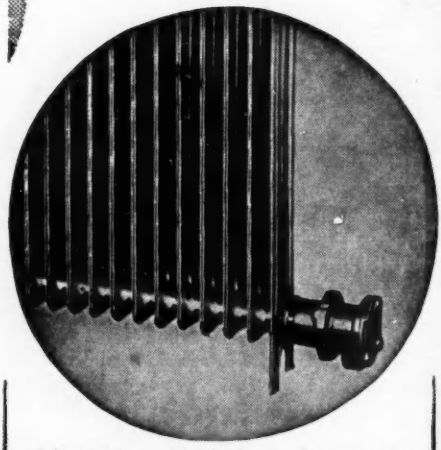

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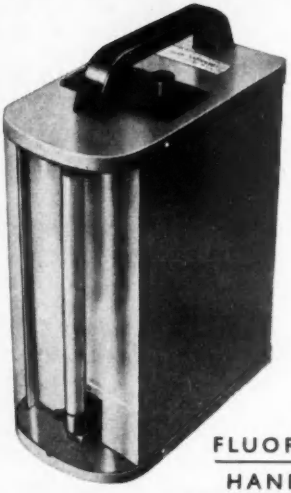

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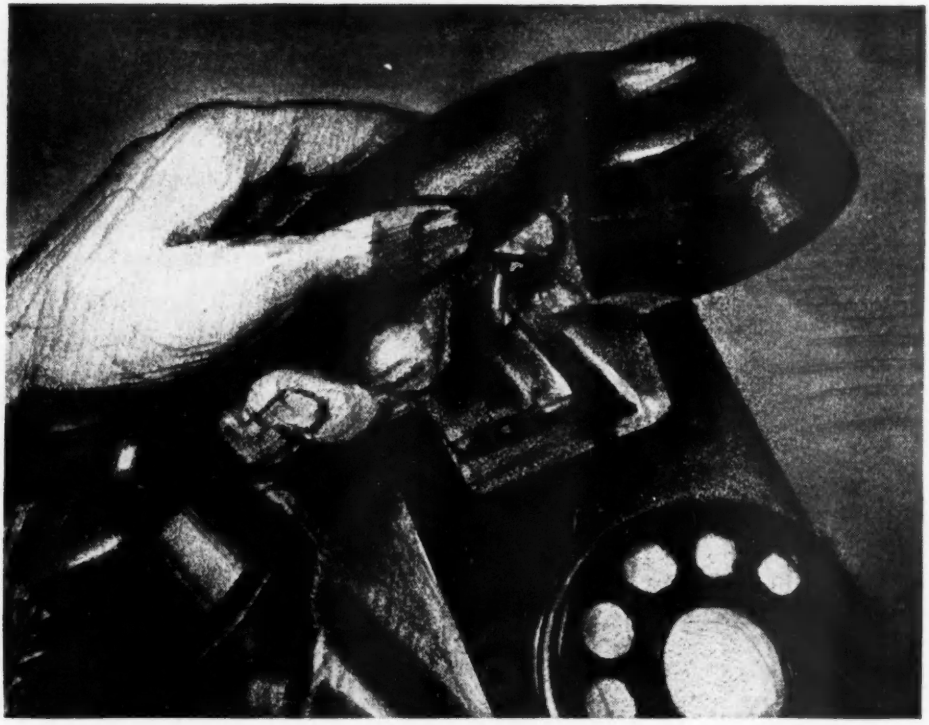

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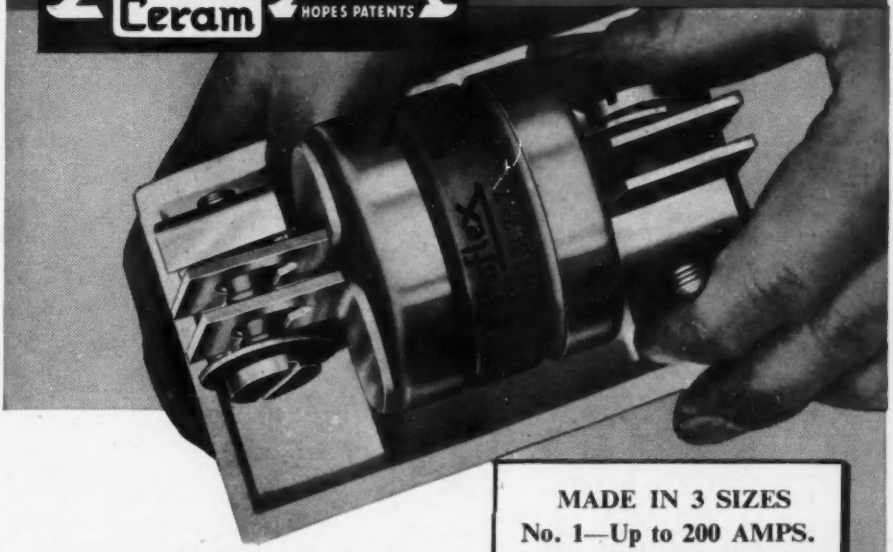

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